0053193

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00-ORL-058

MAY 31 2000

Mr. Douglas R. Sherwood
Hanford Project Manager
U.S. Environmental Protection Agency
712 Swift Blvd, Suite Five
Richland, Washington 99352

Dear Mr. Sherwood:

COMPLETION OF HANFORD FEDERAL FACILITY AGREEMENT AND CONSENT ORDER (TRI-PARTY AGREEMENT) PLUTONIUM FINISHING PLANT (PFP) PROJECT INTERIM MILESTONE M-15-37B

This letter provides notification that the Tri-Party Agreement Interim Milestone M-15-37B, due May 31, 2000, is complete. The Interim Milestone required that the U.S. Department of Energy, Richland Operations Office (RL), "Provide the EPA with complete data packages, including validation, for two cores collected from Tank 241-Z-361; and provide to EPA a recommendation for a regulatory path forward for the disposition on the Tank 241-Z-361 sludge (e.g., expedited response interim remedial action, or defer to the 200-PW-1 Operable Unit)." Enclosed in this transmittal are Appendix A, Validated Data Packages and Recommendation for Regulatory Path Forward for Remediation of Tank 241-Z-361; Appendix B, Radiochemistry-Data Package No. 241-Z-361-222S; and Appendix C, the Raw Data Package. Based on review of the data and regulatory paths, RL recommends that Tank 241-Z-361 be remediated under a non-time critical removal action. The non-time critical removal would allow for the best integration with overall PFP transition and site activities on a risk-prioritized basis making for the most efficient use of personnel and infrastructure.

If you have any questions, please contact me on (509) 376-6888, or you may contact Larry D. Romine, Director, Material Disposition Division, on (509) 376-4747, or Suzanne E. Clarke, Tank 241-Z-361 RL Tri-Party Agreement Project Manager, on (509) 373-4931.

Sincerely,

George H. Sanders, Program Manager
Office of Regulatory Liaison

ORL:JKY

Enclosures (3)

cc w/encl (1): See page 2

ENCLOSURE 1

APPENDIX A

VALIDATED DATA PACKAGES AND RECOMMENDATIONS FOR REGULATORY PATH FORWARD FOR REMEDIATION OF TANK 241-Z-361

TPA MILESTONE M-15-37B

Validated Data Packages

and

Recommendation for Regulatory Path Forward

for

Remediation of Tank 241-Z-361

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1.0 OVERVIEW OF PATH FORWARD RECOMMENDATION

The purpose of this report is to evaluate the need to implement an expedited response action to address the contents of Tank 241-Z-361 (Z-361). Based on the information presented in this report, the U.S. Department of Energy (DOE) concludes that under current conditions the contents of the tank do not pose an imminent threat to human health or the environment into the near future. The sludge does, however, constitute a principal threat waste that will ultimately require remediation under a wide variety of future land use scenarios. Uncertainties regarding the long-term structural stability of the tank suggest that an expedited response to remove the sludge may be prudent.

Current plans require that remediation of the tank and its contents will occur with the remainder of the Plutonium Finishing Plant (PFP) facilities according to the schedule defined in the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement [TPA]) (Ecology et al. 1996). The content and structure of this document are intended to be consistent with the requirements for a removal site evaluation as described in the DOE's guidance for removal actions conducted under the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) (DOE 1994).

The process for identifying the path forward included the following activities:

- Identifying essential risk or threats that required evaluation (i.e., criticality, flammability, tank integrity, and plutonium solubility);
- Identifying subsets of the tank characterization data for use in supporting those evaluations; and
- Reducing the data set and evaluating the information against a set of criteria developed for this evaluation.

The nature of the tank contents and the results of the evaluation are presented in the following sections.

This document provides only a recommendation for a regulatory path forward and should in no way be construed as a commitment by DOE or its contractors to perform any specific action under any specific schedule. Cleanup actions at Tank 241-Z-361 are in the current funding plan, although there are many competing priorities. If the selected path forward requires a funding profile different from that in the current baseline, a baseline change request will be processed to modify the baseline. This report includes preliminary evaluation of the technical basis for a few selected potentially applicable actions to support the development of the recommended path forward. The status of the tank waste after completion of these actions would vary considerably (e.g., some actions may require some period of interim waste storage prior to final disposition of the waste).

The CERCLA process provides a logical order for assessing the life cycle cost and for selecting the remediation alternative. This report is designed to assist in determining the path forward and not to make the final remedial design decision, provide life cycle costs, or select final remedial alternatives. Per CERCLA requirements, the decision regarding the selection of a remediation alternative will be made based upon subsequent work to be performed under an engineering evaluation/cost analysis (EE/CA) or focused feasibility study (FFS). Actual unit costs and life cycle costs for any alternative action will be evaluated as appropriate in the future under either an EE/CA or FFS for a removal action or an interim remedial action, respectively. If action were to be deferred to the 200-PW-1 Operable Unit, ongoing surveillance and maintenance of Z-361 would be required, and cost would be evaluated at the appropriate time.

Results of the characterization and threat analysis for 241-Z-361 indicated the threat of release from the tank is not as serious as was postulated when the Unreviewed Safety Question (USQ) was declared in 1997. The new data on plutonium (Pu) and other fissile isotopes indicate that there are about 25 kilograms (kg) of Pu-239 and about 4 kg of other fissile isotopes in the tank; initial analysis of the new data indicates that criticality is extremely unlikely at this fissile material content. Tank headspace sampling indicates that flammable gas concentrations are far below the lower flammability limit. Analysis of in-tank video records does not yield any indications of imminent structural failure of the tank. Analytical data show that the pH of the sludge is within the range at which Pu is least soluble, thus limiting mobility of the Pu in the event of a leak from the tank. Additionally, there are only very low concentrations of potentially hazardous materials such as ammonia, organics and nitrates. There is no evidence of leakage from the tank. In summary, the preponderance of evidence now available indicates a low threat of release of sludge from 241-Z-361. See Sections 2 and 3 provide for further discussion of site characteristics and threat analysis.

Imminent threat considerations alone do not justify an expedited response for Tank 241-Z-361. However, the Pu and other transuranics in the tank can be classified as principal threat waste, which would provide a basis for early removal. Depending on the technology selected for a response, it may be possible to achieve synergy with other Hanford site cleanup actions or to demonstrate innovative technologies such as in situ vitrification at large scale for possible use elsewhere at Hanford. Also, the Z-361 situation has received enough public attention that some sort of timely cleanup response may be highly desirable even if the threat from the sludge is not as severe as was postulated when the USQ was declared in 1997. See Section 4 for more details on the potential for an expedited response.

DOE has reviewed the three potential regulatory paths available under CERCLA for the remediation of 241-Z-361. A non-time critical removal action would be the most cost-effective for DOE due to the relatively simple regulatory framework for such an action. An interim remedial action would be appropriate if treatability studies were required for the technology selected. Deferral to the 200-PW-1 Operable Unit does not appear to be appropriate for the principal threat waste involved, and it may not be acceptable to the public or to the environmental restoration project. See section 6.2 for additional information.

Based on review of the regulatory paths, DOE recommends that Tank 241-Z-361 be remediated under a non-time critical removal action. It is not known at this time that treatability studies would be required, so this regulatory path is preferred over the more complex and costly interim remedial action. This path has a number of additional advantages. The non-time critical removal would allow for the best integration with overall PFP transition activities on a risk-prioritized basis: Z-361 field activities would likely be scheduled after the most urgent Pu stabilization work has been completed, making for the most efficient use of personnel and allowing for smoother funding profiles. Conducting Z-361 remediation as stabilization is ramping down would also facilitate utilization of PFP expertise in, and infrastructure for, handling Pu-bearing materials while the expertise and infrastructure are still available. All things considered, it appears that a non-time critical removal action would be the most efficient expenditure of taxpayer dollars.

2.0 SITE CHARACTERISTICS

The characteristics of Tank 241-Z-361, including location, historical operations, and a summary of the recent characterization of the tank contents, are described in the following sections.

2.1 Location

Tank 241-Z-361 is an underground concrete settling tank designed, constructed, and operated to remove suspended solids from liquid waste streams generated within the PFP complex at the DOE's Hanford Site 200 West Area. The tank is located just inside the southern boundary of the PFP exclusion fence. The tank's dimensions are 8 meters (m) (26 feet [ft]) long by 4 m (13 ft) wide by 5.2 m (17 ft) deep at the inlet end, with the floor sloping to 5.5 m (18 ft) deep at the outlet end. An isometric view of the tank is shown in Figure 2-1 at the end of Section 2.0.

2.2 Summary of Historical Information

Tank 241-Z-361 received a variety of liquid waste streams from PFP processes during its service life between 1949 and 1973. The single largest volume waste stream historically discharged to the tank was the fluorinator jet off-gas scrubber stream, which consisted largely of dilute neutralized hydrofluoric acid. Wastes discharged to the tank were generally acidic wastes that had been neutralized; however, historical measurements of pH indicated that not all wastes were completely neutralized. In 1975, all but approximately 800 liters (L) (210 gal) of the free liquid remaining atop the sludge in the tank were pumped from the tank, and the tank was isolated by blanking the inlet and outlet pipes. Between the time the tank was isolated in 1975 and the time it was sealed in 1985, sludge samples were collected from various depths at five locations in the tank. The plutonium (Pu) concentration in these samples ranged from 0.09 grams plutonium per liter (g Pu/L) to 1.00 g Pu/L. Based on these measurements, the inventory of plutonium in the tank was estimated to be between 26 and 75 kilograms of plutonium. Because the previous plutonium analyses were not extensively documented, the values reported may not be directly comparable to the plutonium analyses conducted recently.

2.3 Summary of Characterization Actions To Date

The current sampling activities were conducted in 1999 under the requirements of sampling and analysis plans prepared to support specific characterization actions (EQM 1999a, Hill et al. 1998). These include the following activities:

- Performance of a load test of the tank roof to determine load restrictions for characterization activities.
- Preliminary opening of the sealed tank, installation of a high efficiency particulate air (HEPA)-filtered passive vent, monitoring for combustible vapors, and collection of a tank headspace vapor sample for analysis of volatile organic compounds.

- An inspection of the inside of the tank using a video camera.
- Collection of two full-depth sludge core samples from the tank for detailed chemical analysis. Additional tank headspace vapor samples were collected during sludge sampling to evaluate the potential for release of volatile compounds by disturbance of the sludge.
- Performance of down-hole nondestructive analysis (NDA) measurements in dry wells that were previously placed in several risers in the tank.

2.4 Summary of Conditions/Materials Involved

The results of the characterization of Tank 241-Z-361 sludge will be discussed in detail in a tank characterization report that is scheduled for completion in July 2000. The following information has been identified as critical to the determination of the need for an expedited response, as discussed in this document:

- The potential for the presence of flammable concentrations of combustible vapors in the tank headspace;
- The potential for the presence of fissile isotopes at the concentrations and geometry necessary to potentially produce a criticality event;
- The solubility of plutonium contained in the sludge; and
- The integrity of the tank structure and the likelihood that the tank will remain intact until the final remedial action is implemented for the facility.

The following sections discuss the results of the recent sampling and analysis of the contents of Tank 241-Z-361 relating to these factors. Appendix A presents a summary of the laboratory analysis. Appendix C contains the complete laboratory data report.

2.4.1 Tank Headspace Vapor Characteristics

The tank headspace vapors were monitored during the course of the field activities conducted in 1999. Headspace monitoring was conducted via samples drawn through a sampling tube inserted during initial opening of the tank and installation of the HEPA-filtered vent. This tube was lowered into the tank to a depth approximately 0.3 m (1 ft) above the surface of the sludge. The maximum concentration of flammable vapor reported in the tank headspace during both vapor sampling and sludge sampling activities was 3 percent of the lower flammability limit, using a field combustible gas meter calibrated to hydrogen. This result indicates that the tank headspace does not contain vapors at combustible concentrations.

In addition to the field monitoring, samples were collected from the tank headspace for laboratory analysis of volatile organic compounds. Seventeen volatile organic compounds were detected in laboratory analysis of air samples collected from the tank headspace. The concentration of vapors in the headspace remained very stable from the time of the initial headspace sample through collection of the last air sample during sludge sampling. Figure 2-2 shows the distribution of volatile organic compounds measured in headspace air sample number 00E-02, collected during sludge core sample collection, and is representative of the results of analysis of the other headspace samples. The laboratory analysis of vapors collected during sludge sampling revealed seventeen organic compounds totaling 6.08 parts per million by volume (ppmV). Seven compounds accounted for 5.67 ppmV, or 93 percent of the total volatiles. Table 2-1 shows the range of concentrations reported for the seven most abundant organic compounds along with their applicable occupational exposure limits. Field readings of headspace vapors ranged from 2 to 4 ppmV.

Table 2-1.
Range of Concentrations Reported for Selected Volatile Organic Compounds Detected in Tank 241-Z-361 Headspace During Sludge Sampling.

Compound	Range Reported (ppmV)	OSHA Permissible Exposure Limit (ppmV)
Freon 11	0.24 – 0.83	1,000
Chloroform	0.32 – 1.10	50
Tetrachloroethylene	0.32 – 2.00	100
Isobutane	0.22 – 0.50	No limit established
Methylcyclopentane	0.05 – 0.20	No limit established
Trichloroethylene	0.35 – 0.88	100
Carbon Tetrachloride	0.05 – 0.15	10

Carbon dioxide was detected in the tank headspace during the Phase I sampling and analysis at 13,000 ppmV. The carbon dioxide content of the headspace is substantially greater than the typical ambient air content of approximately 330 ppmV and exceeds the Occupational Safety and Health Administration (OSHA) permissible exposure limit by a factor greater than 2. The elevated carbon dioxide likely resulted from historical reaction of acidic waste constituents with neutralizing agents added to the waste, or with the concrete structure of the tank itself. Nitrous oxide also was detected in the tank headspace at a concentration of 110 ppmV, which exceeds the National Institute for Occupational Safety and Health's recommended exposure limit of 25 ppmV. Based on these observed concentrations, the tank headspace does not appear to be acutely toxic. The oxygen content of the tank headspace was consistently near 19.5 volume percent, slightly below ambient air content. The tank headspace also was monitored during field activities with a photoionization detector to evaluate the presence of volatile compounds. These measurements indicated that the tank headspace vapor is composed primarily of air. The results of the field monitoring are consistent with the laboratory analyses.

2.4.2 Evaluation of Radionuclides

The concentration and distribution of radionuclides in sludge from Tank 241-Z-361 were evaluated using laboratory analyses of two full-depth core samples collected from the sludge, and from NDA surveys conducted at an additional location in the tank. The following sections present the results of these measurements.

2.4.2.1 Laboratory Analysis of Sludge Cores

Two full-depth core samples were collected from risers in the tank. Core 263 was obtained from the approximate center of the tank (Riser E) and Core 264 from Riser F, as shown in Figure 2-1. These continuous cores were visually examined in the laboratory as they were extruded from the samplers. Core 263 was found to be continuous from the sludge surface to the bottom of the tank, a depth of approximately 2.16 m (84 inches [in.]). Core 264 was the same overall length, but it exhibited a 32-centimeter (32-cm or 12.5-in.) section with no sample recovery over the depth interval of 84 cm to 116 cm (33.5 to 46 in.) below the sludge surface. Distinct strata within each core were identified based on variations in color and texture of the sludge. Nineteen individual strata were identified in Core 263 and eleven strata in Core 264. The individual strata were analyzed for total alpha activity to ensure safe handling of the sludge samples in the laboratory. After evaluation of the total alpha analyses, strata of similar alpha activity and similar gross features (i.e., visual estimate of color and texture) were combined into composite samples for subsequent analyses in accordance with a sample compositing plan (EQM 1999b). Eight composite samples were prepared from Core 263 and analyzed, and five composite samples were prepared from Core 264 and analyzed. The relative elevation intervals within the sludge that are represented by the composite samples are summarized in Table 2-2. The composite samples are identified sequentially, proceeding from the surface of the sludge to the bottom of the tank, as composite samples 263-1 through 263-8 and composite samples 264-1 through 264-5, respectively.

Table 2-2. Summary of Relative Elevation of Sludge Samples from Tank 241-Z-361.

Composite Identification	Relative Elevation (inches below surface of sludge)	
Core 263 (Riser E)	Top	Bottom
263-1	0	20
263-2	20	34.25
263-3	34.25	38
263-4	38	46
263-5	46	59
263-6	59	65
263-7	65	74
263-8	74	84
Core 264 (Riser F)	Top	Bottom
264-1	0	16.5
264-2	16.5	33.5
No Recovery	33.5	46
264-3	46	62
264-4	62	69
264-5	69	84

A focused set of radioisotopes was selected for detailed evaluation to support the preliminary threat evaluation. These isotopes are plutonium-238, -239, -240, and –241; americium-241; and uranium-235. Figures 2-3 and 2-4 present the distributions of these isotopes in the composite samples for each core. Plutonium-239 was the most abundant isotope detected in the sludge samples. Analytical results were converted to units of grams of isotope per liter (g/L) of sludge for purposes of this evaluation. Table 2-3 gives the results of analysis of these isotopes. Total alpha and total beta analyses are shown in Figures 2-5 and 2-6. The observed beta activity ranges from 0.146 to 3.96 microcuries per gram (μCi/g) throughout both cores; this level of beta activity is consistent with the expected absence of any substantial concentration of mixed fission products in the tank waste.

The sludge also contains numerous elements known to be effective neutron absorbers. Figures 2-7 and 2-8 present concentrations of selected neutron absorbers (chromium, iron, manganese, nickel, and cadmium) in the sludge core profiles. The evaluation of the potential for a criticality event, based on the conditions observed in Tank 241-Z-361, is presented in section 3.1 of this report.

Table 2-3. Summary of Selected Radioisotope Concentrations in Sludge from Tank 241-Z-361.

Composite Sample Number	Am-241 (g/L)	Pu-238 (g/L)	Pu-239 (g/L)	Pu-240 (g/L)	Pu-241 (g/L)	U-235 (g/L)
Core 263						
263-1	0.0058	0.00019	0.4667	0.0360	0.0010	<0.0278
263-2	0.0056	<0.00014	0.5393	<0.0333	0.0009	<0.0266
263-3	0.0035	<0.00018	0.7919	0.0510	0.0010	<0.0270
263-4	0.0013	<0.00007	0.3011	<0.0294	0.0004	<0.0235
263-5	0.0019	<0.00009	0.4540	<0.0339	0.0005	<0.0272
263-6	0.0013	<0.00007	0.3542	<0.0266	<0.0004	<0.0213
263-7	0.0006	<0.00003	0.1642	0.0354	<0.0005	<0.0283
263-8	0.0001	<0.00002	0.0939	<0.0325	<0.0004	<0.0260
Core 264						
264-1	0.0022	<0.00004	0.1499	<0.0248	<0.0003	<0.0198
264-2	0.0054	<0.00014	0.5713	0.0393	0.0010	<0.0261
264-3	0.0023	<0.00012	0.5906	0.0416	0.0005	<0.0259
264-4	0.0020	<0.00013	0.5829	0.0401	0.0005	<0.0283
264-5	0.0005	<0.00003	0.1716	<0.0393	<0.0005	<0.0314

The isotopes identified in the sludge samples and their relative concentrations are consistent with the historical PFP chemical processes that generated the waste.

2.4.2.2 *Nondestructive Assay Analysis of In Situ Sludge*

Nondestructive assay (NDA) techniques were used in the existing aluminum dry wells in Tank 241-Z-361 to provide additional information on the distribution of radioisotopes in the sludge. Two dry wells (in Risers B and G; see Figure 2-1) were determined to be suitable for insertion of the down-hole detector(s) for the NDA work. Although the NDA surveys are ongoing at the time of this writing, preliminary data are available for some of the measurements. The preliminary results cannot be directly correlated to the core sample analyses until the NDA measurements are completely processed. The results of the NDA surveys and discussion of correlation to the core analyses will be presented in the tank characterization report scheduled for completion in July 2000.

The NDA techniques used and the status of the surveys at the time of this writing are given below.

In Riser B:

1. Passive thermal neutron count (field measurements complete);
2. Neutron moisture measurement (field measurements complete); and
3. Gross gamma activity (field measurements complete).

In Riser G:

1. Passive thermal neutron count (field measurements complete);
2. Neutron moisture measurement (field measurements complete);
3. Gross gamma activity (field measurements complete); and
4. Gamma spectroscopy using a high-purity germanium detector and multichannel analyzer (field measurements to be conducted week of May 15, 2000).

The gamma spectroscopy survey of Riser B could not be performed. The aluminum dry well pipe in Riser B was found to be a smaller inside diameter than the pipe in Riser G; the high-purity germanium detector assembly would not pass into the pipe. The preliminary data available at the time of this writing do not provide any quantitative isotopic measurements; however, some general trends are apparent in the preliminary data. The following qualitative observations are based on the preliminary NDA data:

1. The raw data for passive neutron counts measured in Risers B and G follow a consistent trend with depth. The highest neutron counts were recorded in the middle third of the sludge deposit. This trend is consistent with the plutonium-239 concentration trend in the sludge samples analyzed from the Riser E location, as shown in Figure 2-3.

2. The neutron moisture raw data from Risers B and G suggest a fairly consistent moisture content throughout the sludge profile with relatively small variations. This observation is consistent with laboratory-determined moisture content of the sludge from the cores in Risers E and F.

Although the NDA results are preliminary at the time of this writing, an initial qualitative evaluation indicates that the results are consistent with both the laboratory analysis of sludge samples and the preliminary physical conceptual model of sludge deposition within the tank. The results of the NDA surveys and evaluation of correlation with the sludge core sample analyses will be presented in detail in the tank characterization report.

2.4.3 Conditions Affecting Plutonium Solubility

Radionuclides are the primary contaminants of concern in Tank 241-Z-361, with plutonium-239 being of highest concern and present at the highest measured concentration. The primary factors affecting the relative solubility of plutonium in this tank are pH and the presence of substances which solubilize heavy metals through chelation or other processes. The measured pH of the sludge ranged between 8.0 and 9.2 throughout both core profiles, as shown in Figures 2-9 and 2-10.

The Hanford tank farms operation defines pH greater than 8.0 as the target pH for tank wastes to ensure precipitation of plutonium salts (Mulkey et al. 1999). At the alkaline pH observed in Tank Z-361, inorganic plutonium salts should be maintained at their minimum water solubility.

The historical PFP processes utilized tributyl phosphate (TBP) and dibutyl butyl phosphonate (DBBP) in plutonium separation and recovery processes. These compounds can increase water solubility of plutonium. Dibutyl phosphate (DBP) is frequently encountered at the Hanford Site as a degradation product of TBP. The sludge samples were therefore analyzed for TBP, DBP, and DBBP. Concentrations in the sludge ranged from nondetectable at various detection limits to a high of 3 µg/g, as shown in Table 2-4. The relatively low concentrations of these compounds are not expected to substantially increase the solubility of the plutonium distributed throughout the sludge. TBP, DBP, and DBBP are semivolatile and as such were analyzed by EPA Method 8270C (EPA 1997) gas chromatography/mass spectroscopy (GC/MS). Note that Method 8270C does not include TBP, DBP, and DBBP as typical target analytes. However, the calibration tuning and quality control required by Method 8270C were applied to the analytes of interest. TBP and DBBP were extracted and analyzed without derivatization. The preparation of the sample to allow analysis of the DBP was performed by derivatization to allow the GC/MS to detect the compound. For one preparation batch, the recovery of the spiked DBP was low in the quality control samples (e.g., laboratory control samples and matrix spikes) associated with the batch; therefore, the DBP results from that preparation batch are estimated. Estimated values are flagged with a "J" in Table 2-4. Recoveries of the other compounds in the quality control samples were acceptable.

Table 2-4. Summary of Semivolatile Organic Compound Analyses for Tank 241-Z-361 Sludge.

Composite Number	TBP (µg/g)	DBP (µg/g)	DBBP (µg/g)
Core 263			
263-1	0.6	3	<17
263-2	0.2	<49 J	<18
263-3	0.6	<43	<16
263-4	0.6	0.4	<16
263-5	0.6	<39	<14
263-6	0.4	0.5	<17
263-7	0.4	2	<17
263-8	2	0.6	<16
Core 264			
264-1	<18	0.5	<14
264-2	0.4	<41	<15
264-3	2	0.3 J	<17
264-4	1	<44 J	<16
264-5	<23	<49 J	<18

2.4.4 Tank Structural Integrity Evaluation

A qualitative assessment was conducted of the apparent structural integrity of Tank 241-Z-361. The objective of the assessment was to determine whether the tank structure could reasonably be expected to remain intact until implementation of the final remedial action for the operable unit. This assessment was based on the following observations and measurements:

- Assessment of as-built diagrams for the tank;
- Results of the static tank dome loading test conducted prior to sampling activities; and
- Observations of the condition of the interior of the tank recorded on videotape during recent field activities.

Section 3.1 describes the results of the evaluation of the structural integrity of the tank.

Figure 2-1. Isometric View of Tank 241-Z-361 and Identification of Risers.

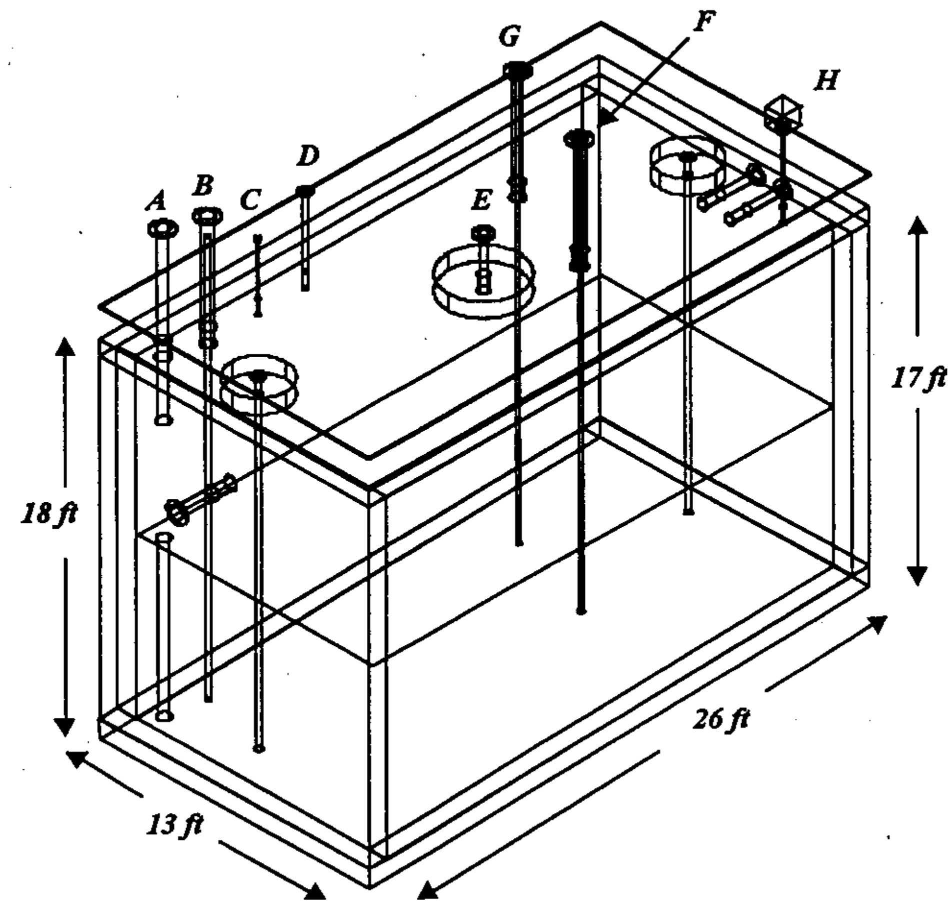


Figure 2-2. Typical Distribution of Volatile Organic Compounds in Tank 241-Z-361 Headspace Air.

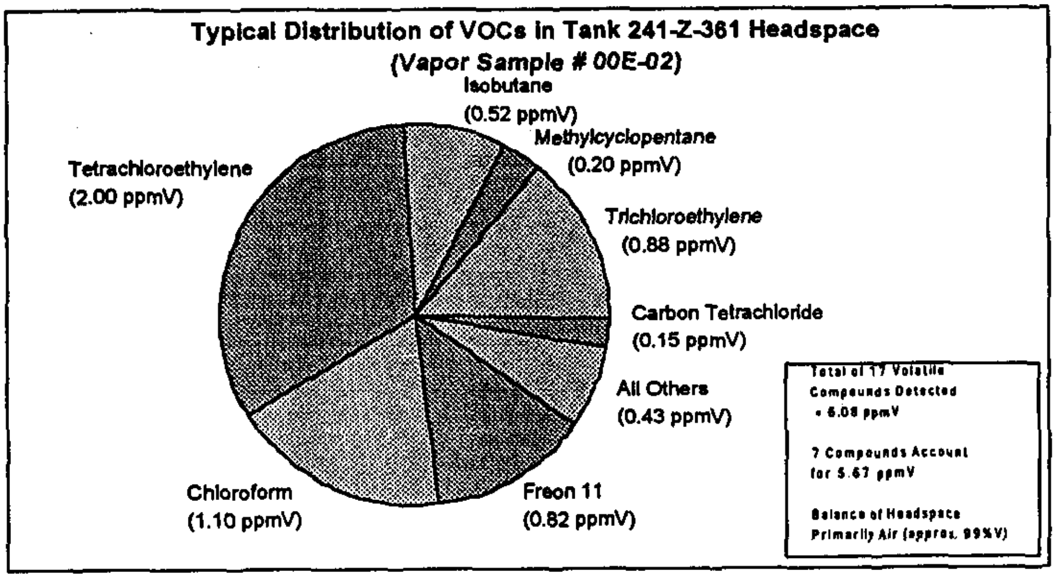


Figure 2-3. Vertical Distribution of Selected Radionuclides in Core 263 (results on wet weight basis).

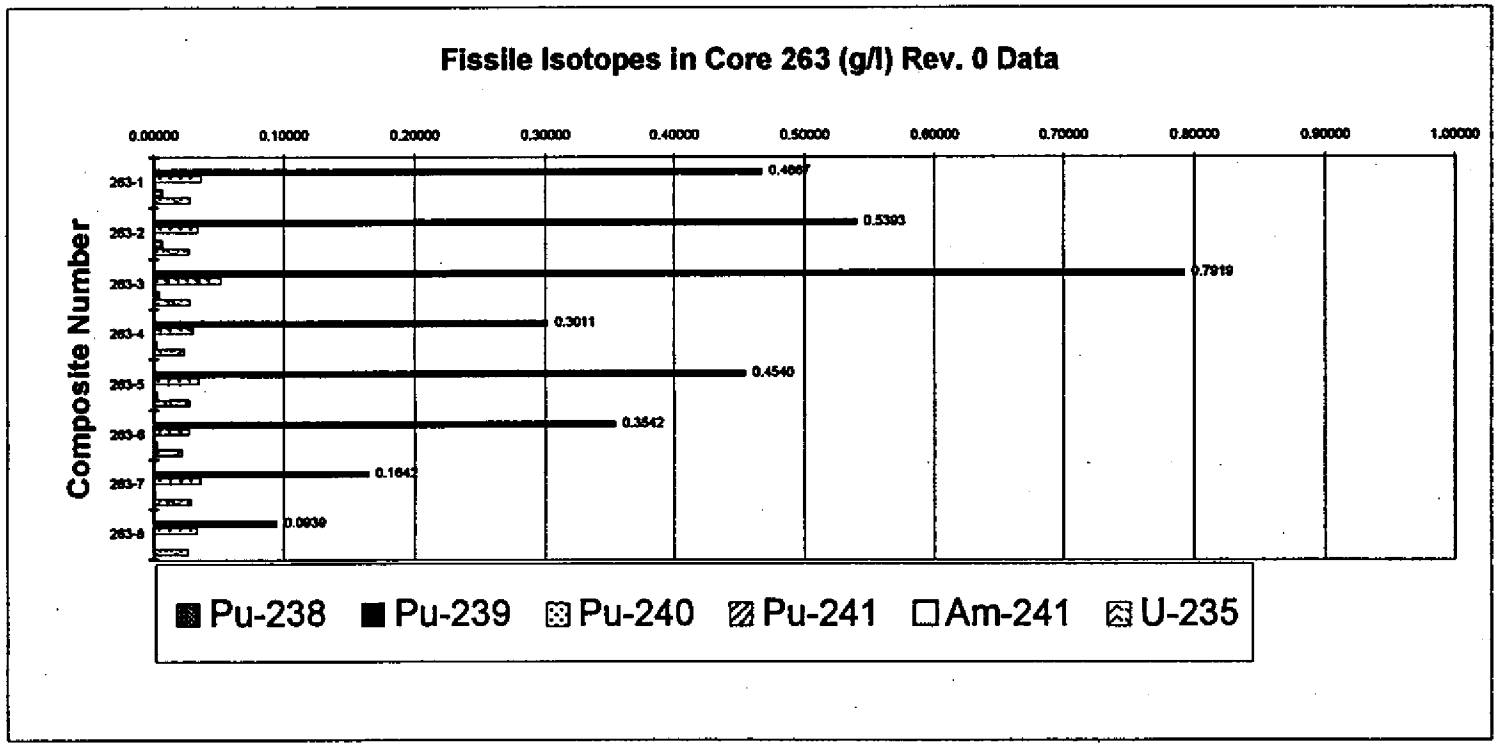


Figure 2-4. Vertical Distribution of Selected Radionuclides in Core 264 (results on wet weight basis).

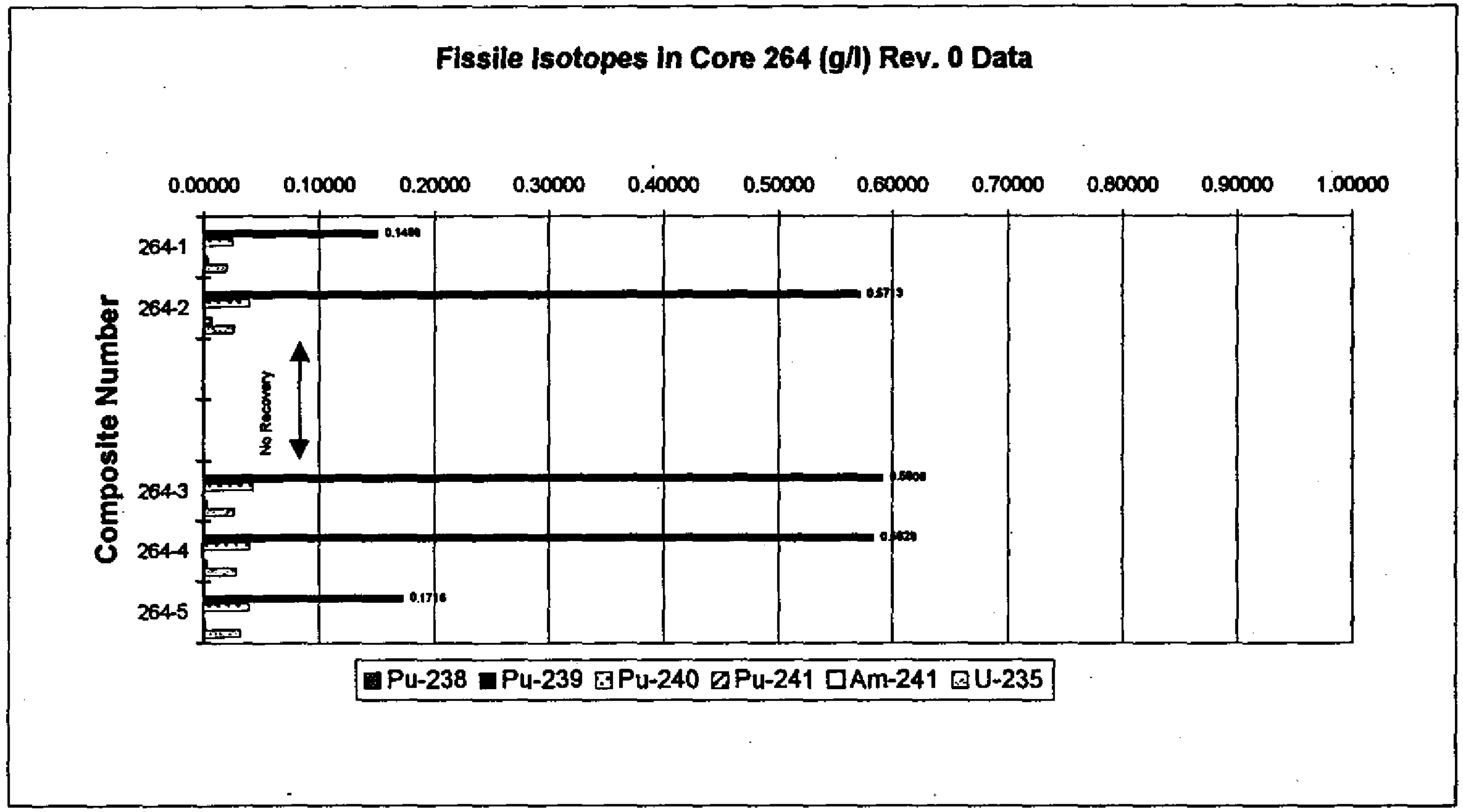


Figure 2-5. Vertical Distribution of Total Alpha and Total Beta Activity in Core 263 (results on wet weight basis).

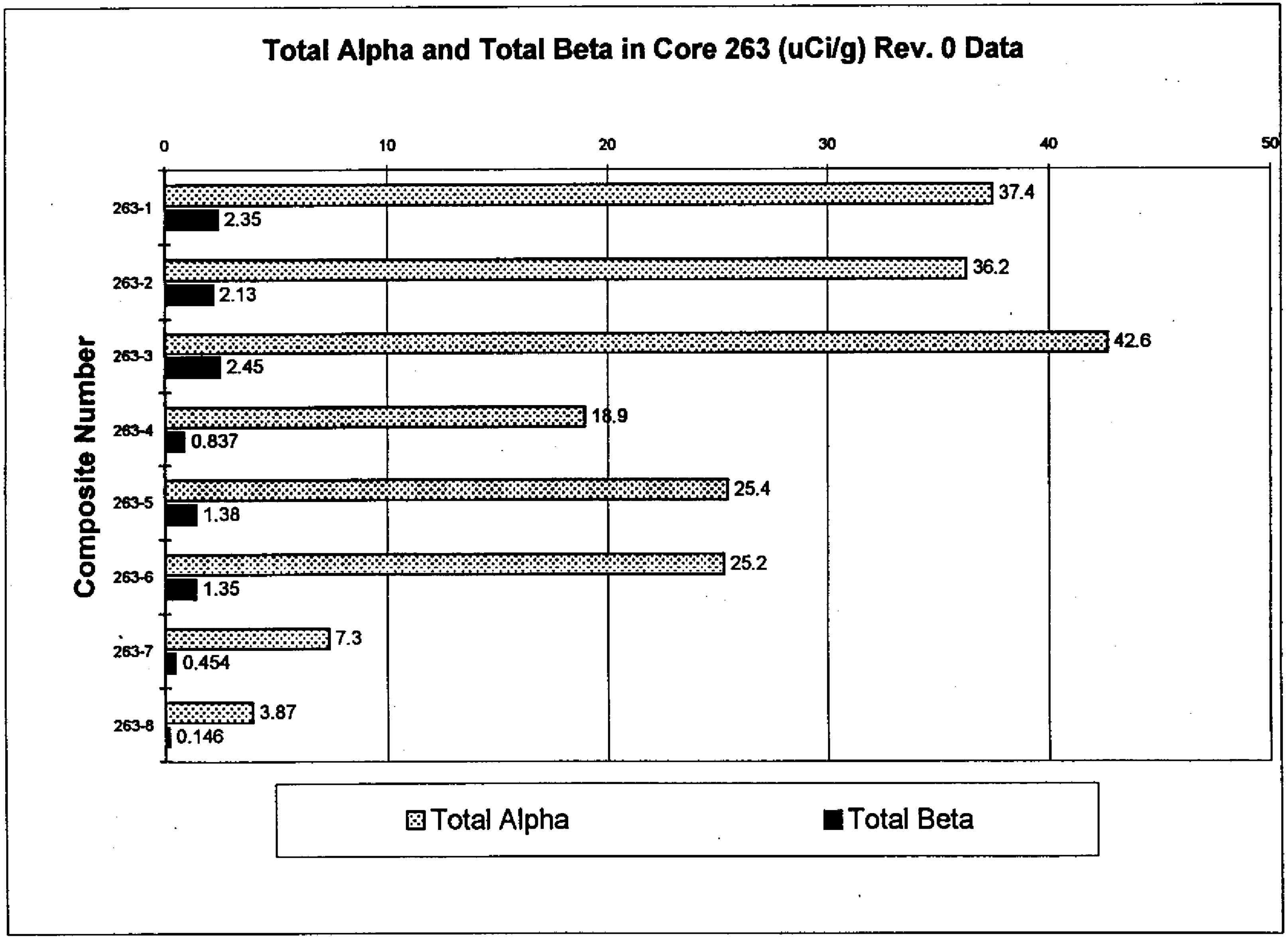


Figure 2-6. Vertical Distribution of Total Alpha and Total Beta Activity in Core 264 (results on wet weight basis).

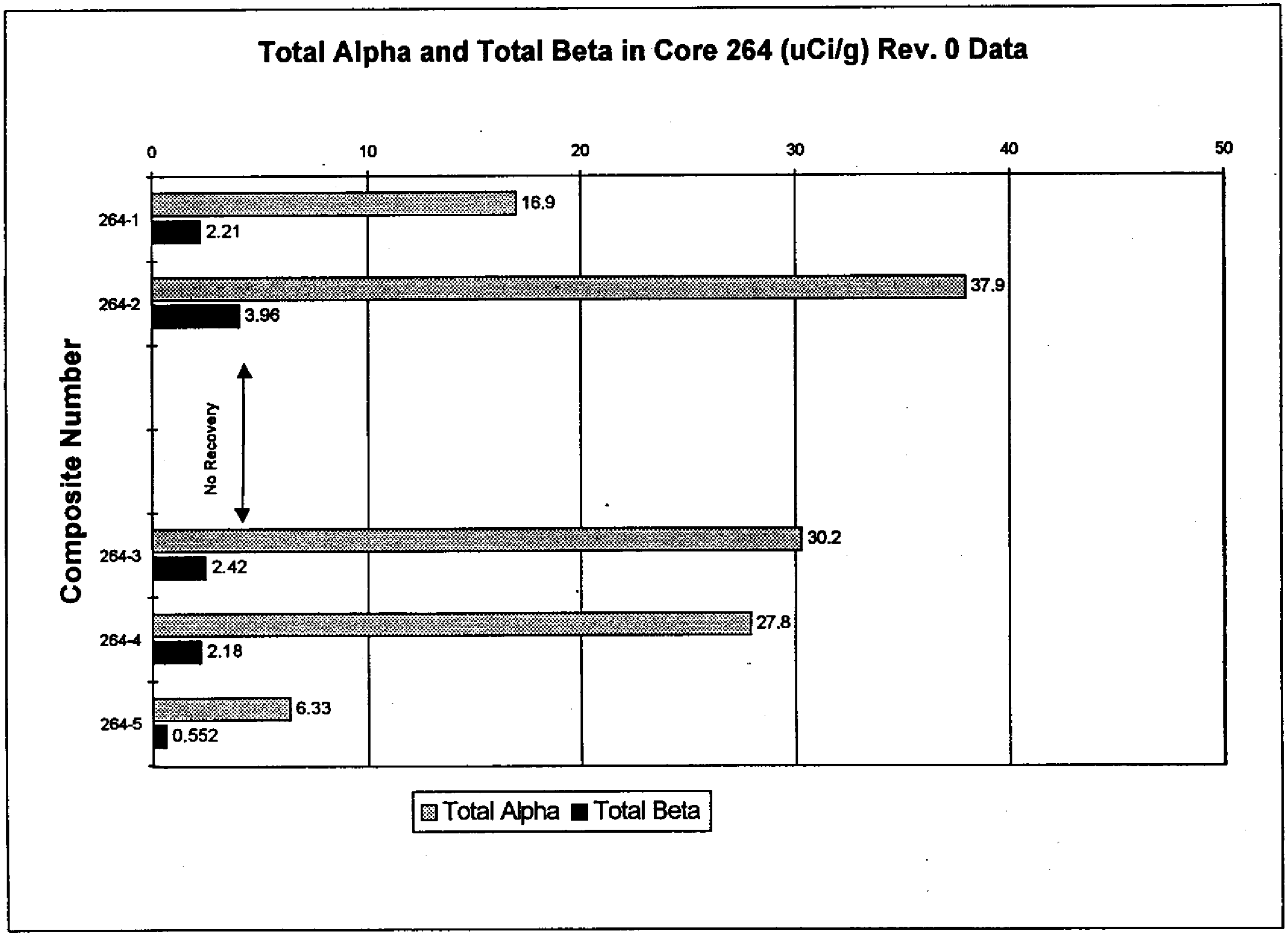


Figure 2-7. Vertical Distribution of Selected Neutron Absorbers in Core 263 (results on wet weight basis).

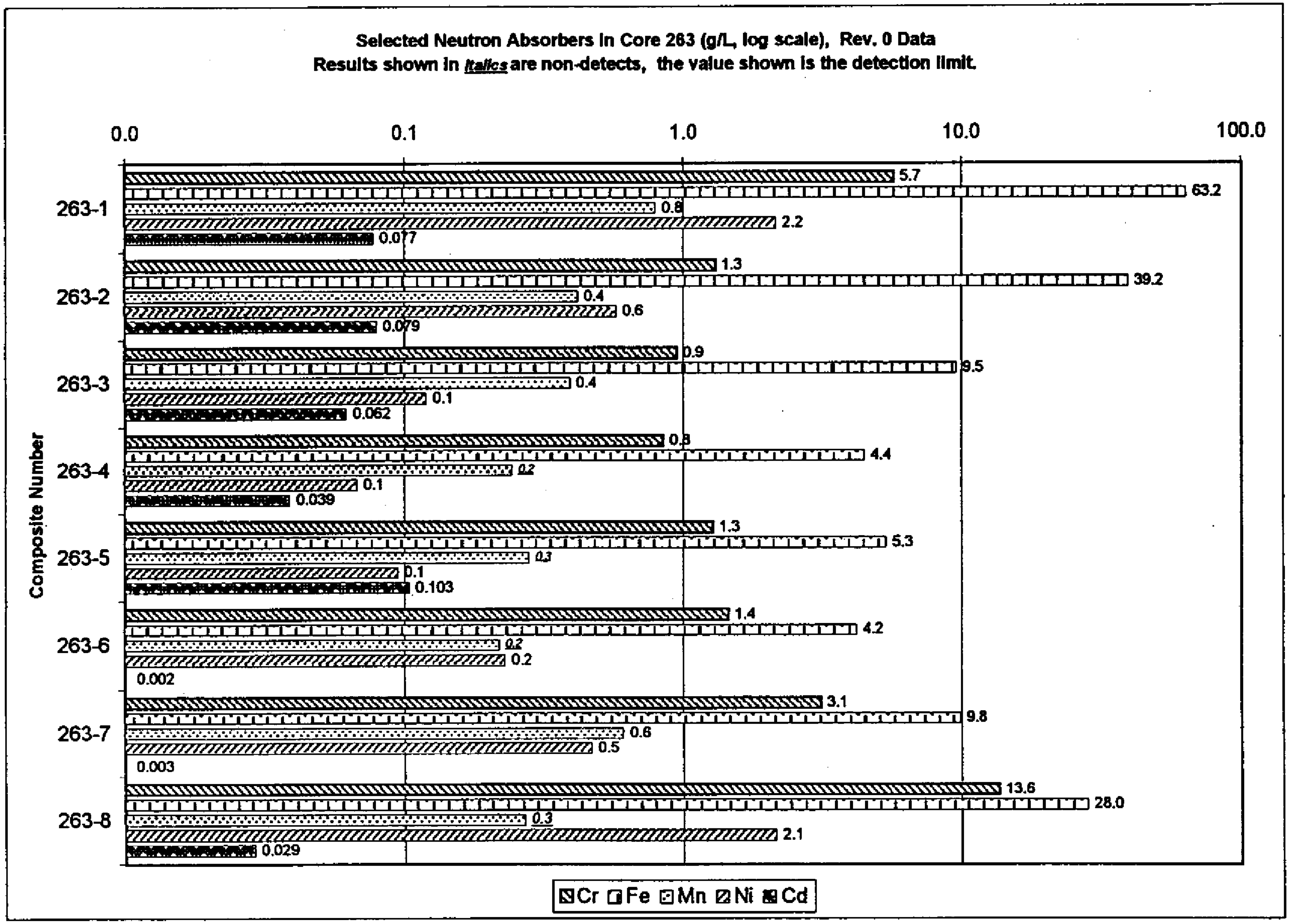


Figure 2-8. Vertical Distribution of Selected Neutron Absorbers in Core 264 (results on wet weight basis).

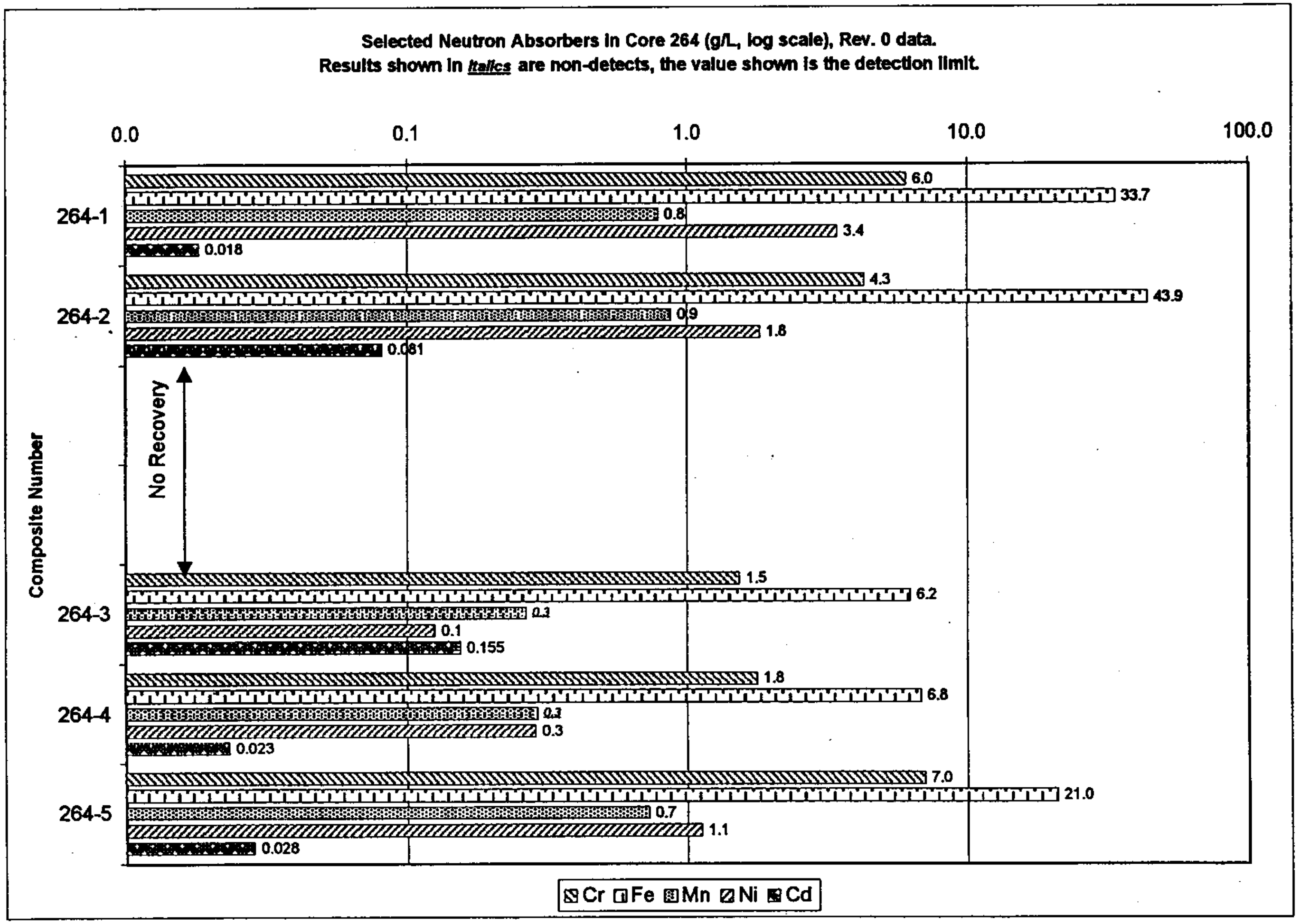


Figure 2-9. Vertical Distribution of pH Levels in Core 263.

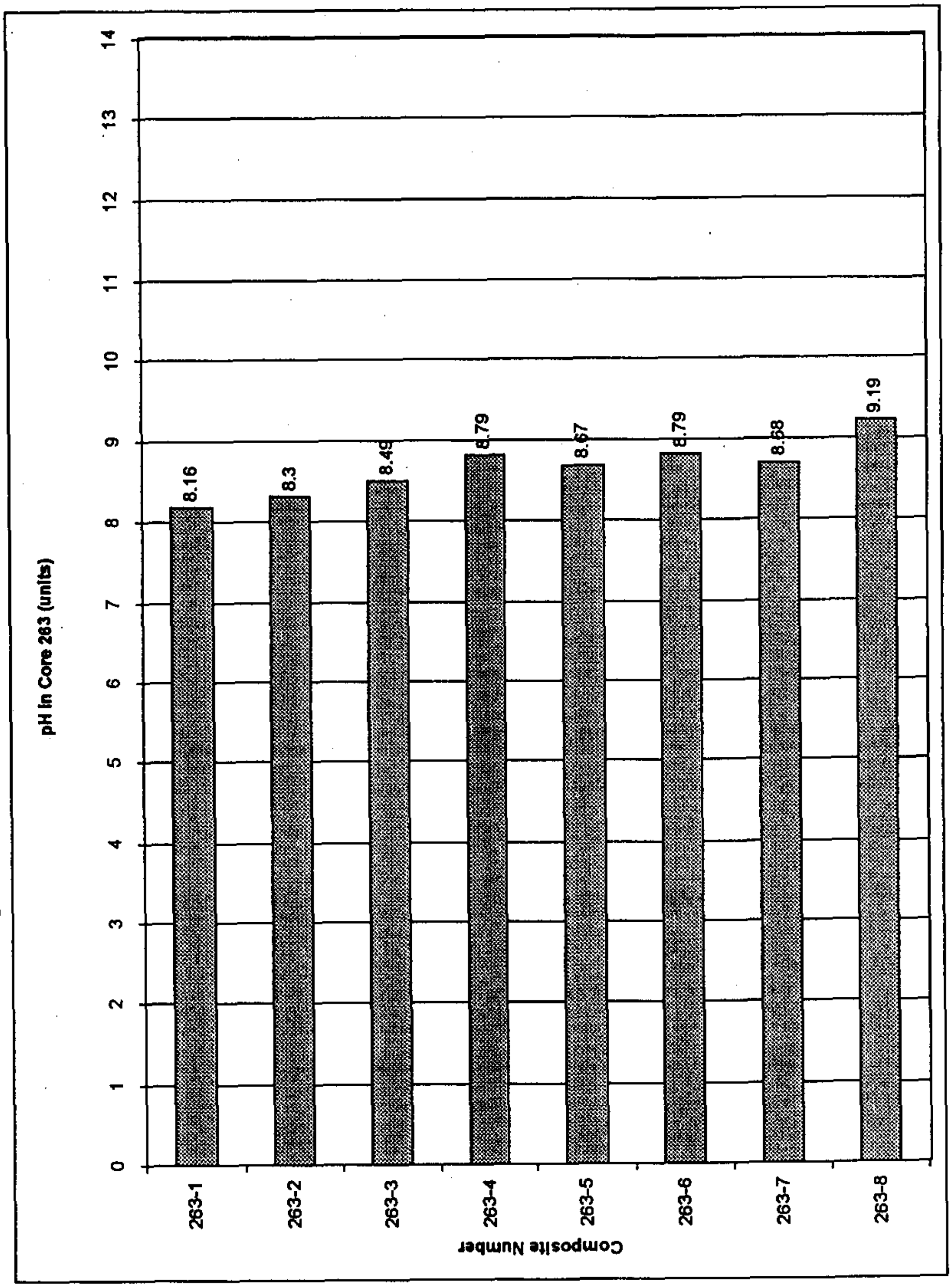
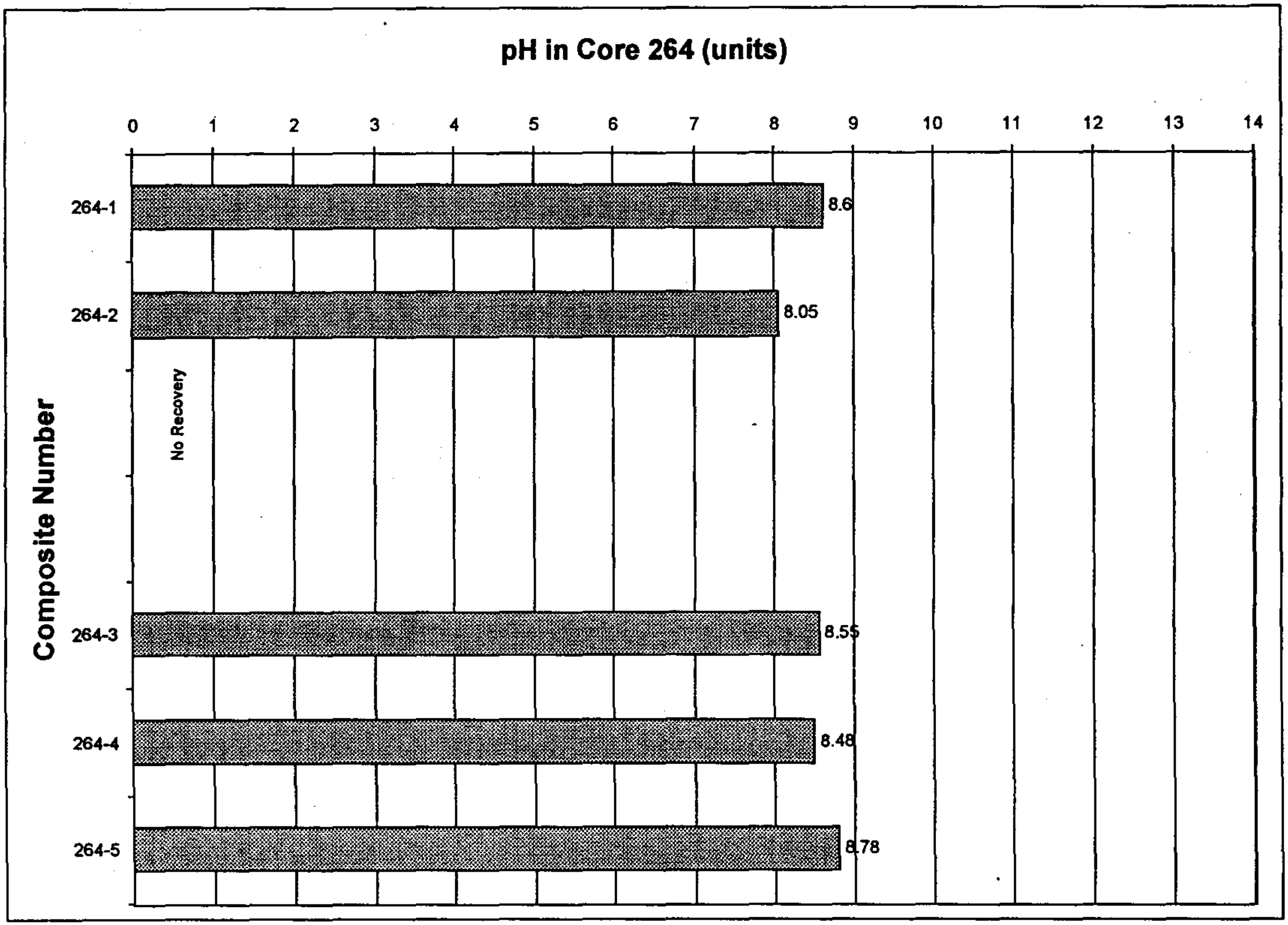


Figure 2-10. Vertical Distribution of pH Levels in Core 264.



3.0 THREAT ANALYSIS

Potential human health and environmental hazards associated with Tank 241-Z-361 were evaluated in *Justification for Continued Operation for Tank 241-Z-361*, HNF–2024, Revision 2 [PHMC 1999]. The results from that evaluation have been integrated with observations made during recently performed new work, and new analyses have been conducted. These new analyses have confirmed prior analytical results.

DOE considered the eight risk factors identified in 40 CFR 300.415 (b) (2) when evaluating the path forward.

40 CFR 300.415 (b) (2)
The following factors shall be considered in determining the appropriateness of a removal action pursuant to this section:

- *(i) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants;*
- *(ii) Actual or potential contamination of drinking water supplies or sensitive ecosystems;*
- *(iii) Hazardous substances or pollutants or contaminants in drums, barrels, tanks, or other bulk storage containers, that may pose a threat of release;*
- *(iv) High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate;*
- *(v) Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released;*
- *(vi Threat of fire or explosion;*
- *(vii) The availability of other appropriate federal or state response mechanisms to respond to the release; and*
- *(viii) Other situations or factors that may pose threats to public health or welfare of the United States or the environment.*

Prior hazard analyses and evaluations performed of the new characterization information have been used in the assessment of the eight risk factors in 40 CFR 300.415 (b)(2).

- There are no identified exposures to nearby populations, animals, or the food chain occurring as a result of Tank 241-Z-361. The hazard analyses have identified some low probability mechanisms that could result in exposure to the tank's contents. The most significant potential release mechanism was flammable gas deflagration. This potential hazard has been eliminated with the installation of continuous, filtered ventilation and application of other flammable gas controls. If the tank structurally fails, nearby workers could potentially be exposed to the tank's contents. Although there is no indication of imminent tank failure, there is uncertainty regarding the long-term structural integrity of the tank. Controls have been implemented to ensure the load on the tank is limited and to restrict access of personnel around the tank to reduce the likelihood of exposure in the event of failure.

- There is no evidence that drinking water or sensitive ecosystems are being contaminated from releases from Tank 241-Z-361.

- Tank 241-Z-361 contains hazardous substances. If the tank structurally fails, there is a threat of release. As noted above, although there is no indication of imminent tank failure, there is uncertainty regarding the long-term structural integrity of the tank. Controls have been implemented to ensure the load on the tank is limited to reduce the likelihood that damage to the tank occurs that may cause its failure and release of the tank's contents. The thick, viscous nature of the tank's contents reduces the likelihood of rapid release even if the tank were to fail.

- There is no evidence of high levels of hazardous substances or pollutants in the soils at or near the surface that may migrate.

- In general, weather conditions would not cause hazardous substances or pollutants to be released or migrate. However, extreme snow loads or rainfall could apply weight loads to the tank that over time could contribute to structurally damaging the tank.

- The threat of fire and explosion from the tank has been eliminated by the application of continuous, filtered ventilation, and other flammable gas control mechanisms during activities that require tank entry.

- Tank 241-Z-361 is located at the Plutonium Finishing Plant at the Hanford Site. The PFP and the Hanford Site have integrated, comprehensive mechanisms that are available to respond to emergencies and releases. Hanford Site emergency and spill response mechanisms are also integrated with Local, Regional, State, and Federal emergency and spill response mechanisms.

- Potential hazards and threats have been comprehensively evaluated in hazards analyses performed for Tank 241-Z-361. The principal additional potential hazard is an inadvertent criticality of the tank's contents. Recent analysis confirms the conclusion of prior analyses that inadvertent criticality of Tank 241-Z-361's contents is extremely unlikely.

Potential tank hazards are discussed in more detail below.

3.1 Human Health Threats

Tank 241-Z-361 is located on the government-controlled Hanford reservation, about 27 miles from the nearest population center. The tank is located within the protected area of the PFP. A systematic evaluation of the potential hazards was performed as a part of the justification for continued operation (JCO). This analysis considered potential hazards for facility workers and maximally exposed individuals in the general public located at the Hanford site boundaries. The following key potential hazards to human health were formerly postulated to exist: 1) pressurized, flammable gas tank atmosphere; 2) unevaluated structural condition for the tank; and 3) time-related phenomena that could invalidate prior criticality analysis. Recent activities were conducted to respond to these concerns.

3.1.1 Flammable Gas

The tank has been opened and a filtered vent has been installed. When the tank was opened after having been sealed for more than 14 years, the concentration of flammable gases was much less than 5 percent of the lower flammability limit (LFL). The filtered vent will ensure that no significant flammable gas concentrations develop in the future during steady state conditions. In addition, the waste was locally disturbed during core sampling. Flammable gas concentrations were monitored during waste sampling and no significant gas release events were detected. As shown in Figure 3-1, measured flammable gas concentrations were all below 5 percent of LFL. During steady state conditions and during locally waste-disturbing activities, there was no evidence of a potential hazard associated with flammable gas buildup in Tank 241-Z-361.

3.1.2 Structural Integrity

As a result of uncertainty about the structural condition of the tank, a weight test was performed on the tank top in 1998. This weight test showed the tank top load-bearing capacity is at least 4000 pounds. Conservative weight limits and access control restrictions are being maintained under the facility authorization basis to avoid conditions that might degrade the structural integrity of the tank. When the tank was opened, a video was taken of the interior and analyzed (Baxter 2000). This analysis concludes that the tank wall condition has not visibly degraded in comparison to photographs taken in the mid-1980's. The tank top was not photographed in the past, so comparisons are not possible. The recent video shows that there are some cracks in the tank top and some of the reinforcing bar has been damaged. No indications of imminent failure have been identified. Because of the waste in the tank, no determinations can be made regarding the structural integrity of the tank bottom. As a result of continuing uncertainty about the tank structural condition, the recent analysis supports the continued application of the current weight limits for this tank. The access restrictions and weight limit controls largely eliminate the potential for exposure to the tank contents through tank structural failure, but the tank structural integrity cannot be assumed to last indefinitely. This would be a concern if remediation was deferred to the 200-PW-1 OU.

3.1.3 Criticality

Tank 241-Z-361 has been estimated to contain about 25 kilograms (kg) of plutonium-239 and about 4 kg of other fissile isotopes. Most of the past efforts to better understand the tank contents have been driven by an effort to better understand the potential for accidental criticality. These past analyses concluded that accidental criticality was extremely unlikely (Lipke 1997). Newly available data related to criticality safety are the subject of a new analysis (Greenborg 2000). New data fall within the scatter band of the earlier data and follow the previously observed trend in plutonium concentration with sludge depth. The most recent video shows small puddles of free liquid visible on the surface of the sludge in some areas. During sample core extrusion, small amounts of free liquid were observed on top of the uppermost core segments, but there was little or no free liquid within the body of the sludge. These observations indicate that the sludge is saturated with liquid, which confirms that the tank contents remain substantially overmoderated. Water content data further confirm overmoderation. The tank also contains significant quantities of neutron-absorbing materials that further prevent an inadvertent criticality. The recent tank characterization data were obtained more than 20 years after some of the earlier tank characterization data. No significant change has been observed in the data over this time. Accordingly, there is no indication of long-term changes in the tank contents that would increase the likelihood of criticality. As a result, the analysis of the new data confirms that Tank 241-Z-361 can appropriately remain a limited control facility, and the potential for criticality remains extremely unlikely.

Recent tank characterization data show that Tank 241-Z-361 contains polychlorinated biphenyls (PCBs), which are regulated under the Toxic Substances Control Act (TSCA), and a number of metals regulated under the Resource Conservation and Recovery Act (RCRA). These materials are known or suspected to cause human health effects. The source of the PCBs is unknown. The elimination of the potential flammable gas hazard for Tank 241-Z-361 precludes postulated mechanisms of tank deflagration that could lead to widespread release of tank contents. Criticality mechanisms that could lead to release of the tank's contents are extremely unlikely. Tank structural failure at some future point cannot be excluded as a possibility. People would have to be near the tank at the time structural failure occurred to be affected. Access controls and weight limits have been implemented to greatly reduce the risk of exposure to the tank contents under these scenarios. As such, the mechanisms that could cause human exposure to the tank's contents have been eliminated or are under effective control to reduce the risk of such exposure.

3.2 Threats To The Environment

The JCO also evaluated potential threats to the environment. The principal additional scenario leading to a release to the environment that was not discussed in Section 3.1 is a leak of the tank contents that ultimately reaches groundwater. The recent video indicates the tank contents are at about the same level as they were during photographs taken in the mid-1980's. The fact that the level of sludge in the tank has not changed suggests that there have not been any significant leaks from the tank, although the possibility of some leakage in the past cannot be ruled out.

Helical piers were installed in 1999 to support the bridge for the sampling truck. These piers extend beneath the depth of the tank bottom, and some are within a few feet of the tank. Some piers were installed in an incorrect location initially and had to be removed and reinstalled. The piers were surveyed upon removal and no radiological contamination was detected. The lack of detected radiological contamination and the apparent stability in tank level suggest that there has been no significant leak.

Even if a pathway out of the tank existed today or in the future, rapid release and spread of the tank's contents to surrounding soils and groundwater is unlikely. Core samples taken from the tank show the material to be highly viscous with little free liquid, much like toothpaste in consistency. The tank is located in an arid region about 70 meters above the groundwater. The tank has been isolated from sources of water supply. As a result, the tank contents are unlikely to leave the tank confines rapidly, and there is little free liquid available that would drive migration of any leaked material to groundwater through this dry and relatively thick vadose zone.

3.3 Anticipated Changes In Site Conditions

Other than planning to remediate potential residual hazards associated with Tank 241-Z-361, no changes are anticipated in site conditions for the foreseeable future. Inadvertent changes to site conditions are precluded by continued administrative controls. Tank 241-Z-361 is located within the protected area of the PFP. General public access to PFP is not allowed and is prevented by physical security measures. Access by PFP workers to Tank 241-Z-361 is also restricted except under approved work authorizations.

3.4 Regulatory Compliance Considerations

The sludge in Tank 241-Z-361 will be designated as transuranic (TRU) waste based on the content of plutonium and americium. Plutonium and americium concentrations exceed the TRU definition of >100 nanocuries per gram (nCi/g) of alpha emitters with half-lives greater than twenty years, established as criteria in the Waste Isolation Pilot Plant Land Withdrawal Act (Public Law 102-579). The tank contains enough plutonium that it falls under the control of the Atomic Energy Act. In addition, the sludge is expected to be designated as mixed waste based on the content of metals regulated under the Toxicity Characteristic (40 CFR 261.24). The Toxicity Characteristic Leaching Procedure (TCLP) (EPA 1997) was not performed on the sludge samples; however, the results of total metal analysis of the sludge were compared to Toxicity Characteristic total metal screening levels of twenty times the applicable TCLP extract concentration limit to evaluate the sludge for compliance. This screening approach is consistent with the approach described in U.S. Environmental Protection Agency (EPA) guidance (EPA 1994). The results of this screening are presented in Table 3-1.

Table 3-1. Comparison of Total Metal Concentration in Tank 241-Z-361 Sludge Samples to Toxicity Characteristic Screening Levels.

Regulated Metal	Range of Concentration Reported in Samples From Cores 263 and 264 (mg/kg)	Toxicity Characteristic Total Metal Screening Level (mg/kg)	Number of Samples Exceeding the Screening Level
Arsenic	< 10 – 23.4	100	0 of 13
Barium	87.1 – 197	2,000	0 of 13
Cadmium	1.48 – 112	20	8 of 13
Chromium	691 – 10,000	100	13 of 13
Lead	32 – 446	100	6 of 13
Mercury	19 – 177	4	13 of 13
Silver	15.6 – 182	100	2 of 13

ND = not detected

Although the total metal analyses are not directly comparable to the TCLP limits, the consistently high concentrations of some metals (e.g., cadmium, chromium, lead, and mercury) present in total analyses suggest that the sludge would be likely designated as a characteristic waste. Transuranic mixed wastes (TRU waste with hazardous/dangerous waste constituents) are subject to the land disposal restrictions (LDR) program un RCRA (40 CFR 268.42(d)). The WIPP Land Withdrawal Act of 1992 (PL 102-579, 106 stat 4777) exempts mixed wastes that are sent to the WIPP from compliance with LDR treatment requirements. All mixed wastes, however, must be characterized for proper waste designation and must be managed and stored as hazardous waste prior to disposal.

During preparation of the sludge Sampling and Analysis Plan (EQM 1999a) for Tank 241-Z-361, polychlorinated biphenyls (PCBs) were identified for analysis due to the general widespread use of PCBs across Hanford Site in the past. There was no evidence of routine disposal of PCBs to the tank during its useful life.

The results of polychlorinated biphenyl analyses from Tank 241-Z-361 core samples are summarized below. The results are from composite samples by depth for the two core samples obtained. Only two Aroclors (1248 and 1254) were detected in sludge samples. The two highest PCB concentrations analyzed were 50.6 and 160 parts per million, both on a dry weight basis as required by the *Toxic Substances Control Act of 1976* (TSCA) Subpart O 761.295. The analysis method required by TSCA, SW-846 Method 8082 (EPA 1997), was used for PCB analysis. Because CERCLA has no specific requirement for reporting on wet weight or dry weight, Table 3-2 presents the data in both dry and wet weight. The source of the PCBs is unknown.

Table 3-2. Summary of Aroclors Detected in Tank 241-Z-361 Sludge.

Composite Sample ID	Analyte	Result (mg/kg wet weight basis)	Moisture (weight %)	Result (mg/kg dry weight basis)
Core 263				
263-1	Aroclor-1248	5.35	71	18.4
	Aroclor-1254	<1	71	<3.4
263-2	Aroclor-1248	2.525	69.1	8.2
	Aroclor-1254	<1	69.1	<3.2
263-3	Aroclor-1248	5.98	62.7	16.0
	Aroclor-1254	<1	62.7	<2.7
263-4	Aroclor-1248	2.28	52.2	4.8
	Aroclor-1254	<1	52.2	<2.1
263-5	Aroclor-1248	<1	70.3	<3.4
	Aroclor-1254	<1	70.3	<3.4
263-6	Aroclor-1248	<0.2	70.8	<0.7
	Aroclor-1254	0.322	70.8	1.1
263-7	Aroclor-1248	<0.2	69.5	<0.7
	Aroclor-1254	1.24	69.5	4.1
263-8	Aroclor-1248	<0.2	65.4	<0.6
	Aroclor-1254	0.577	65.4	1.7
Core 264				
264-1	Aroclor-1248	3.78	84.4	24.2
	Aroclor-1254	<0.4	84.4	<2.6
264-2	Aroclor-1248	11.8	76.7	50.6
	Aroclor-1254	<1	76.7	<4.3
264-3	Aroclor-1248	56	65	160.0
	Aroclor-1254	<4	65	<11.4
264-4	Aroclor-1248	<1	67.1	<3.0
	Aroclor-1254	<1	67.1	<3.0
264-5	Aroclor-1248	2.6	66.3	7.7
	Aroclor-1254	<0.2	66.3	<0.6

Figures 3-2 and 3-3 show the distribution of detected Aroclors from each core from the surface to the bottom of the tank. Numbers that are *underlined* are sample detection limits and are reported based on dry weight. Sample detection limits are calculated based on weight of sample, dry weight, and any dilutions of the sample.
CERCLA requires the evaluation of applicable and relevant and appropriate regulations (ARARs). As such, TSCA must be considered. 40 CFR 761.50 (b)(3) indicates that PCBs

released to the environment before 1978 with concentrations less than 50 parts per million are not subject to TSCA regulation. Regulations also indicate that PCBs released to the environment before 1978 with concentrations $\geq$50 ppm are evaluated by the EPA Regional Administrator for TSCA to assess whether imminent risk exists. The same regulation indicates that sites containing such wastes are presumed not to present an unreasonable risk of injury to health or the environment. The regulation also indicates that the EPA Regional Administrator may request additional data to evaluate the risk and determine the disposal approach after the data are generated. Because this is the initial data report and further information is forthcoming, the EPA has not assessed the data at this time.

3.5 Summary of Threats and Uncertainty

The potential threats posed by Tank 241-Z-361 have been systematically analyzed. The analyses show that flammable gas deflagrations have been precluded, and inadvertent criticality is extremely unlikely. The principal uncertainty is how long the structural integrity of the tank can be assured; the possibility of future leakage or structural failure cannot be ruled out. Controls are in place to prevent applying loads that might further damage the tank. These controls also reduce the likelihood that workers might be exposed to the tank's contents if structural failure were to occur. No need for new controls has been identified. Based on the considerations above, overall threat from the tank is considered quite low at the present time.

Figure 3-1 Measured Flammable Gas Concentrations

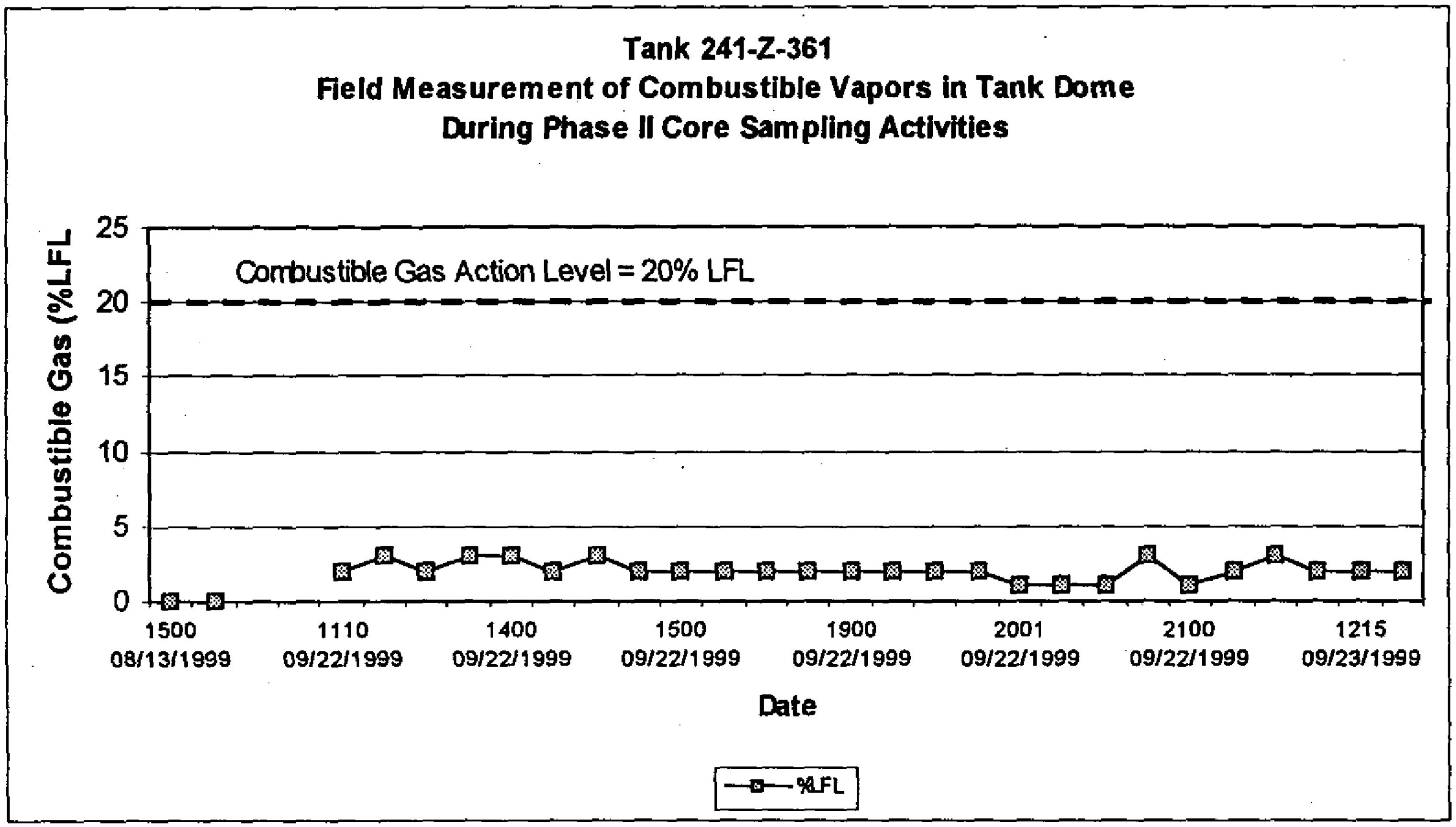


Figure 3-2. Vertical Distribution of PCBs in Core 263 (results on wet weight basis)

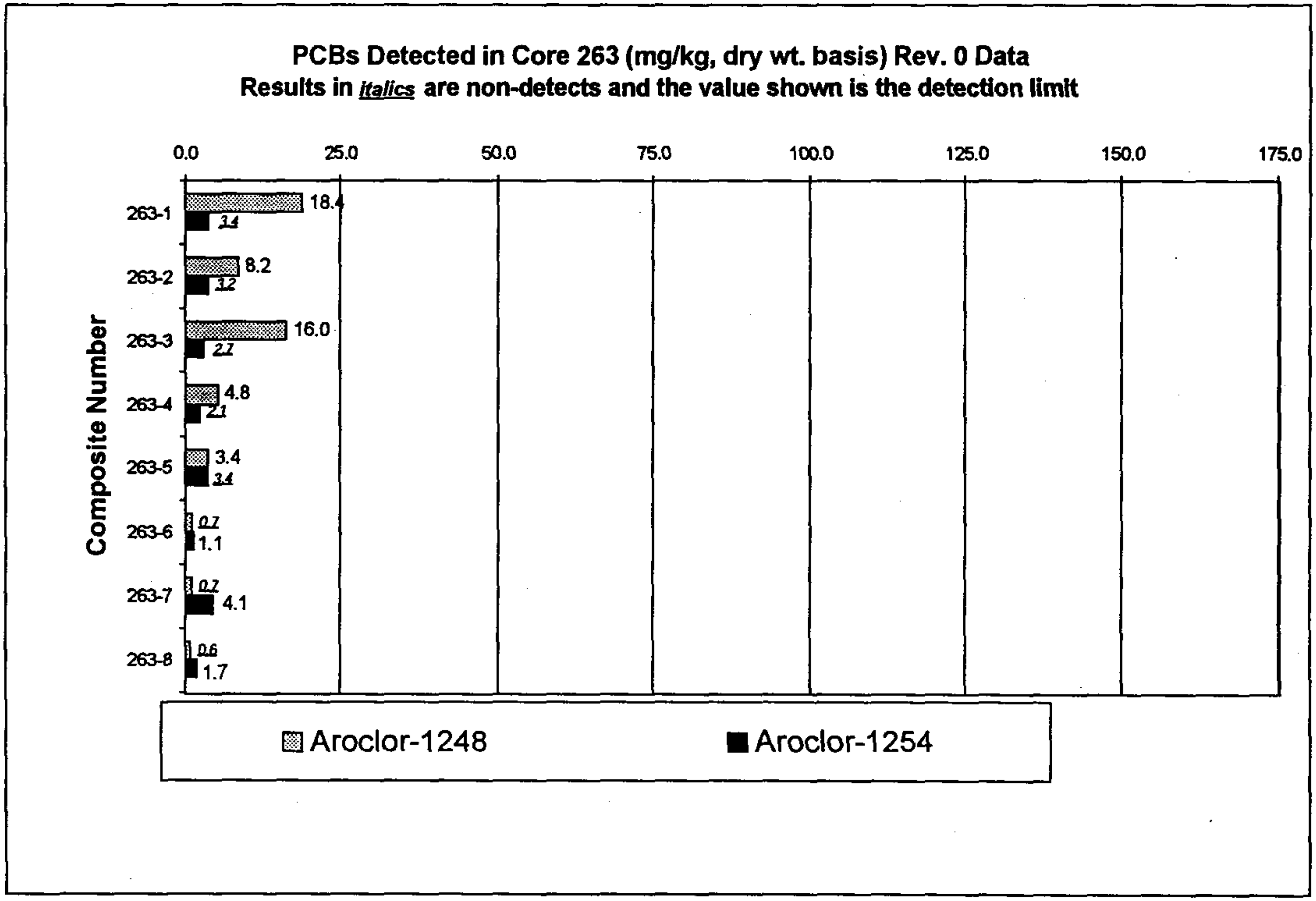
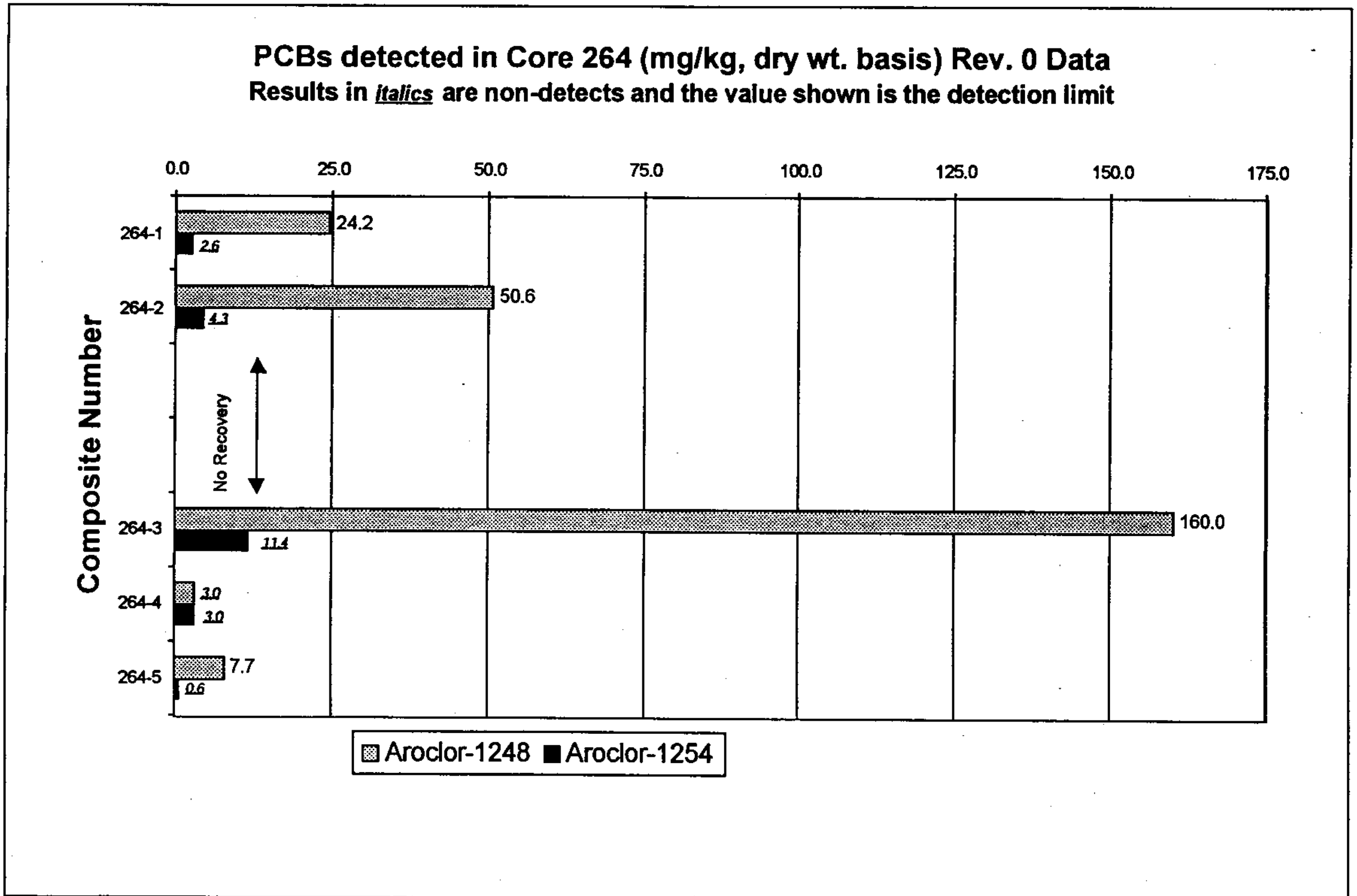


Figure 3-3. Vertical Distribution of PCBs in Core 264 (results on wet weight basis).



4.0 ANALYSIS OF NEED FOR EXPEDITED RESPONSE ACTION

Based on the threat posed by the current conditions related to Tank 241-Z-361, the appropriateness of an expedited response action is discussed in the following sections.

4.1 Expedited Response Criteria

The Hanford TPA (Ecology et al. 1996) provides for an expedited response action under the following circumstances:

1. In the event that the lead regulatory agency determines that a situation represents "an imminent and substantial endangerment to the public health or welfare or the environment because of an actual or threatened release," the EPA can require DOE to "immediately initiate activities" to abate the danger or threat (Section 7.2.3 of the TPA). This type of activity generally corresponds to an emergency or time-critical removal action under the National Contingency Plan (NCP).

2. If data at any time indicate that an expedited response is "needed or appropriate because of an actual or threatened release," the lead regulatory agency can require DOE to submit a proposal for an expedited response (TPA Section 7.2.4). This approach corresponds to either a non-time critical removal action or an interim remedial action under the NCP.

3. The DOE also has authority under Section 2 of Executive Order 12580 to implement removal actions in circumstances other than emergencies (TPA Section 7.2.4).

Actions conducted under CERCLA require that the principal threats to human health and the environment be mitigated through the remedial process. The EPA has established a preference that treatment will be used to address principal threats posed by sites wherever practicable. The principal threat concept is applied to source materials at CERCLA sites. A source material is material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contamination to groundwater throughout, surface water, or air, or acts as a source for direct exposure (EPA 1999). Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur.

The EPA considers the following materials to be examples of principal threat wastes (EPA 1999):

- Liquid source material – waste contained in drums, lagoons, or tanks, free product in the subsurface (such as nonaqueous phase liquids) containing contaminants of concern (generally excluding groundwater).

- Mobile source material – surface soil or subsurface soil containing high concentrations of contaminants of concern that are (or potentially are) mobile due to wind entrainment, volatilization (e.g., volatile organic compounds), surface runoff, or subsurface transport.
- Highly toxic source material – buried drummed nonliquid wastes, buried tanks containing nonliquid wastes, or soils containing significant concentrations of highly toxic materials.

In general, a removal action will be initiated if there is sufficient risk to public health or the environment to require that steps be taken in a relatively short time frame. Removals are classified under CERCLA as "Emergency," "Time-Critical," and "Non-Time Critical," depending on the urgency associated with the situation and the available time for implementation of a response. An interim remedial action may be required if there is a determination that, although there is a potential risk, there is sufficient time available to plan a response that is consistent with the overall site remedy.

The actions that may be appropriate for the contents of Tank 241-Z-361 are similar for either a non-time critical removal or an interim remedial action. Current information does not indicate a basis for either an emergency or a time-critical action. The discriminators between a non-time critical removal and an interim remedial action are related to the effort required for planning and implementation, and complexity of the planning effort. The decision criteria are as follows:

- If the action can be scoped and implemented with no requirement for treatability studies, then the action may be conducted as a non-time critical removal action.

- If scoping requires treatability studies, then the action may be conducted as an interim remedial action.

The risks associated with leaving the sludge in the tank will determine the need for, and appropriate level of, response. The results of field observations and sampling and analysis described in previous sections will determine the nature of the risks associated with the tank contents. The DOE has identified the following technical criteria to determine whether there is a basis for an early removal action:

1. *Flammability*. If measurements of the tank headspace indicate the presence of combustible vapors in excess of 20% of the lower flammability limit (LFL), then sludge removal may be necessary.

2. *Criticality*. If analysis of the sludge indicates that there is a basis for concern (or significant uncertainty remains after analysis) over criticality due to the fissionable isotopes in the sludge, then the sludge could be a candidate for early removal.

3. *Tank Integrity*. If load testing and/or observations of the tank suggest that the tank may not remain structurally stable over the time frame anticipated for remediation of the entire operable unit, then sludge removal may be necessary.

4. *Contaminant Mobility.* If the contaminants in the sludge are potentially mobile, the need for early removal will be determined based upon the following considerations:

    a. *Historical leakage.* If the tank appears to have leaked in the past, removal will be considered.

    b. *Consequences of a release.* If a release would cause an increased exposure to workers or the environment or if a release would substantially complicate future remedial actions, then removal will be considered.

5. *Principal Threat Waste.* If the sludge in the tank constitutes a principal threat waste (EPA 1991) that will require remediation under future use scenarios, then an expedited response action may be considered in the absence of actual release or exposure at the present time.

In addition, the following considerations will enter into the evaluation of the appropriateness of an early removal:

- Funding priority and availability must be factored into the decision, based on the risk identified through the technical analyses.

- If an early removal will enhance the efficiency of activities to support the final remedy, this aspect could support an early removal independent of risk.

- If demonstration of a technology or capability would be valuable in supporting overall remedial program objectives, this could support an early removal.

Figure 4-1 illustrates the logic flow for the determination of whether a removal or an interim remedial action is appropriate for the sludge. A removal would be initiated if any one of the four primary technical analyses (flammability, criticality, structural integrity, or contaminant mobility) indicated a high level of risk associated with leaving the sludge in the tank. If there is not sufficient risk to require a removal or interim action for imminent threat reduction, the lead regulatory agency may determine that an expedited response action is still appropriate to address a principal threat waste, based on consideration of the additional criteria listed above. A removal or interim action also could be initiated at some future date if changes in circumstances result in an increase in risk from the tank contents.

4.2 Appropriateness of an Expedited Response Action

Based on the sludge characteristics described in section 2 and the threat analysis presented in section 3, neither of the first two criteria in section 4.1 appears to apply to the situation of the Z-361 sludge. Therefore, an expedited response action would not be required on those bases. However, an expedited response for the tank sludge could proceed under the third criterion in section 4.1, which cites Executive Order 12580.

Viewed in the flow of Figure 4-1, the decision to proceed with an expedited action would be based on addressing the sludge as a principal threat waste. Although the sludge does not pose an imminent threat at this time, the nature of the waste (especially its high plutonium content) and its location (within a buried tank of questionable long-term integrity that cannot be readily inspected or monitored) supports identifying the sludge as a principal threat waste. Allowing the sludge to remain in its present form and location for an indefinite period of time is unlikely to be acceptable under current future use scenarios for the facility due to the potential threat of release.

The sludge in Tank 241-Z-361 meets the definition of a principal threat waste as a highly toxic material in a buried tank based on the measured plutonium content of the sludge. The primary considerations for an expedited response to manage the sludge in Tank 241-Z-361 are as follows:

1. The sludge constitutes a principal threat waste due to its plutonium content.

2. The tank structure is expected to remain stable in the near term (e.g., less than 5 years), but the continued tank stability in the long term (e.g., 5 to 10 years) is uncertain.

3. The actual time frame to address Tank 241-Z-361 under its current operable unit status has not been established and may not occur until after the planned closure of PFP operations. If the sludge is left in place, continued administrative and physical controls will be required. The tank is presently managed under administrative controls administered by the PFP organization and physical controls (e.g., access restriction) supported by the PFP operational infrastructure until the planned plant closure (including removal of nuclear materials) in approximately fiscal year 2016. The continuation of the tank administrative and physical controls after discontinuation of PFP operations will require additional organizational efforts.

4. The PFP organization currently maintains procedures for handling and managing plutonium-containing materials and has a body of personnel experienced in handling such materials. This body of institutional capability will likely be dispersed after PFP closure currently planned for FY 2016.

5. Addressing the sludge under an expedited response will be one factor in facilitating the timely transition of the PFP facility to the environmental restoration (ER) program. In particular, the ER program is not at this time set up to manage wastes which require criticality safety controls and is thus reluctant to accept the tank as is.

In addition to the preceding primary considerations, the following issues should be included in considerations of the appropriateness of an expedited response action for Tank 241-Z-361:

- The project to characterize the tank contents and address the TPA Milestone has created a degree of knowledge and detailed understanding of alternatives (Section 5) available for carrying out a removal project. This "momentum" would have to be rebuilt at a later time if removal is deferred to the 200-PW-1 Operable Unit remediation.

- A removal project can be conducted without physically interfering with, stabilization and other transition activities in progress at PFP during the same time, since the Z-361 tank is outside the main 234-5Z facility. There would, of course, be potential conflicts over funding and technical resources, unless Z-361 remediation were conducted after most Pu stabilization has been completed.

- Based on the characterization information, it is now understood that the order-of-magnitude cost for a removal project is a factor of 2 to 3 lower than the 1999 baseline, thus having substantially less impact on overall site budget than previously expected.

- The Hanford Advisory Board has emphasized interest in early removal.

- A near-term removal project would provide tangible evidence of cleanup progress.

- Referring to Section 5, one of the alternatives to be considered for removal would be synergistic with a major sludge removal project for K-Basins.

- Also referring to Section 5, another of the alternatives being considered would provide an excellent demonstration for application of in situ vitrification to other waste sites at Hanford.

- Should removal of the sludge be selected (as opposed to in situ vitrification), removal may be able to use equipment being provided for retrieval of sludge in projects in the 300 area at Hanford (fluidic pumps).

If the funds are available, these reasons provide an appropriate basis for proceeding with an expedited response of some type.

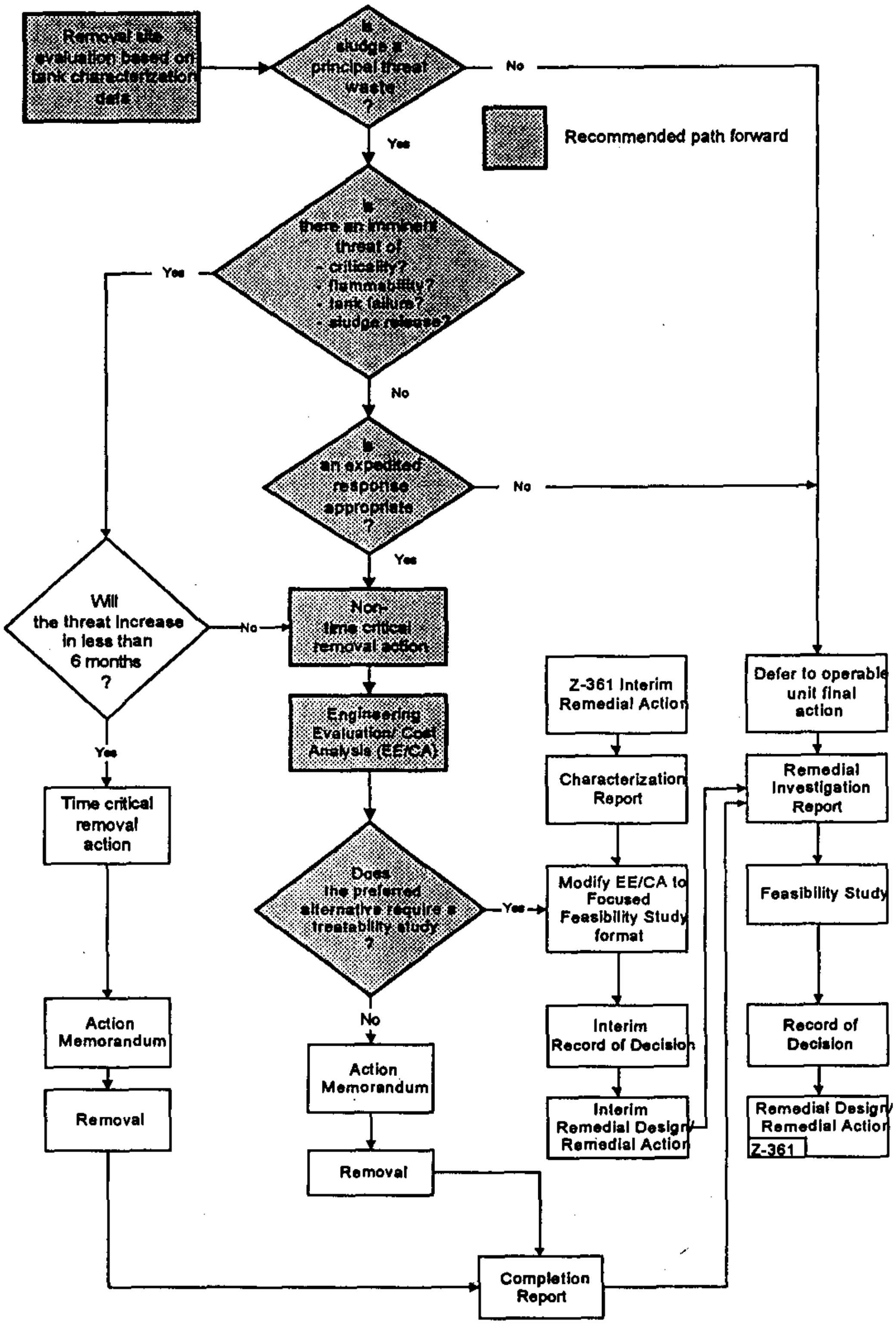
4.3 Appropriateness of an Interim Remedial Action vs. a Non-Time Critical Removal Action

In proceeding with an expedited response, a further requirement is to classify the project as either a non-time critical removal action or an interim remedial action. From the viewpoint of project execution, there is not much difference between the two choices. That is, for any specifically selected alternative, the overall set of activities to design, fabricate, and carry out the project will not vary widely in schedule or cost, nor would the environmental impact of the chosen alternative be significantly different, whether done as a non-time critical removal action or an interim remedial action.

Therefore, the appropriateness of classifying the project as a non-time critical removal action or an interim remedial action depends on whether treatability studies are needed. Of the alternatives discussed in section 5.2, such studies would not be required for cementation, storage prior to ultimate cementation, or vitrification as glass logs, since these technologies are well developed. Should one of these alternatives be selected, the project would best be performed as a non-time critical removal action.

In situ vitrification (ISV) is another of the alternatives investigated for which the technology is fairly well developed. However, there is sufficient variation between past experience and the proposed application to Tank Z-361 such that treatability studies would be prudent. Therefore, ISV might best be performed as an interim remedial action.

Figure 4-1. Logic Flow Diagram for Evaluation of Need for Expedited Response Action at Tank 241-Z-361.



5.0 PROJECT PATH FORWARD

With the characterization work on Tank 241-Z-361 nearly complete, the project is moving from gathering information toward selecting a remediation option for nearly complete implementation. Depending on the regulatory path decided upon by EPA, the next phase of the project would be conducted as either an engineering evaluation / cost analysis (EE/CA) for a removal action or as a focused feasibility study (FFS) for an interim remedial action, in accordance with CERCLA requirements. Once the EE/CA or FFS has been completed, the project would move into remedial or removal design and then into the remedial or removal action, as appropriate. If action were deferred to the 200-PW-1 Operable Unit, continued safe storage of the sludge would have to be assured until a remedial action is implemented.

As of this writing, the Z-361 project is now doing detailed planning for fiscal years 2001 and 2002 based on the characterization and other information now available. The project is on the Hanford Integrated Priority List for $2 million per year in FY-01 and -02. When more detailed information is available from the conceptual design work under the EE/CA or FFS, detailed cost and schedule estimates for the life of the project will be prepared for use in requests for funding for fiscal years 2003 and beyond. Current planning is based on the assumption that the project will go forward as a remedial or removal action. If remediation is deferred, the lower level of activity associated with deferral would require some replanning for transition of the tank to the ER Project.

5.1 Project Approach

During the early stages of the EE/CA or FFS in FY-01, further studies will be conducted on the various remedial options to facilitate a fully informed choice of the best option available. During the latter stages of the EE/CA or FFS, conceptual design will be conducted on the selected option so as to define requirements, prepare a cost and schedule estimate for the entire project, and otherwise prepare for the detailed remedial or removal design. Remedial or removal design would commence in FY-02, and implementation activities would probably begin in FY-03, assuming funding is available.

Specific goals and objectives for the Z-361 project are described below.

5.1.1 Project Goal

The goal of the Z-361 Remediation Project is to address the sludge as a principal threat waste by determining the extent of the hazards and the threat of release actually associated with Tank Z-361, and by remediating any hazards identified as appropriate. Should an expedited response not be required, the goal of the project will be to store the sludge in place safely for as long as necessary.

5.1.2 Project Objectives

Specific objectives of the Z-361 project are as follows.

- Ensure safe storage of the sludge in Z-361.
- Select the technology and disposal path to be used to remediate the sludge consistent with the regulatory path decided upon by U.S. EPA. Remediation, if necessary, could be accomplished either by removing the sludge from the tank and immobilizing or storing it, or by immobilizing the sludge in place.
- Implement physical modifications at PFP as necessary to support remediation.
- Select one or more contractors (as appropriate) to implement the remediation.
- Remediate the sludge by the means selected in accordance with standards and by dates to be agreed upon in future discussions between EPA and DOE. (The remediation method, schedule, and cost will be determined during the EE/CA or FFS as noted above.)
- Complete the project within approved budget, which will be determined later.
- Ensure safe storage / transition to final decontamination and demolition.

5.2 Preliminary Technical Response Alternatives

Several technical response alternatives are available for a removal action for the sludge in Tank Z-361. Although the scope of the milestone is for the sludge only, one of the alternatives described below also includes remediation of the tank.

Selection of an alternative must address several key considerations/decisions:

- Is stabilization of sludge to be conducted after retrieval of the sludge or in situ?
- If sludge is to be retrieved, should it be done with mechanical removal as a semisolid or by fluidic sluicing?
- If sludge is to be retrieved by sluicing, should it be done as a thick or thin slurry?
- What is the stabilization method to be used (for example, containerizing, cementing, vitrifying) and is it permanent or interim?
- What type of in-process characterization is needed?
- Where is the stabilized material to be stored until ultimate disposal?
- Where is the ultimate disposal location and what disposal site acceptance criteria must be satisfied?

- In evaluating an alternative, all of these questions must be assessed for technical factors, environmental and safety factors, cost, and schedule.

A preliminary set of alternatives specific to circumstances at the Hanford Site and to Tank Z-361 has been identified for evaluation should there be a need to proceed with a response. These are listed in Table 5-1 and are conceptually described in a separate report (Negin 2000). To proceed, a more detailed conceptual development of the alternatives must be conducted, and evaluation conducted for selection of the preferred technical path forward. This additional evaluation of alternatives will be performed under an EE/CA or FFS, as appropriate.

Table 5-1 Conceptual Alternatives For Removal Action for Sludge in Z-361

Alternative	Description
I. Sludge retrieval, cementation, transport to storage onsite	Sludge is retrieved by pumping as a thick slurry to approximately 1500 55-gallon drums containing mixers for cement/sludge homogenization. The sludge is assayed in process before solidification. Cement, plus other additives as determined by the process control program, are added to the sludge, which is allowed to harden. The drums are transported to on-site storage, and eventual disposal would be to the Waste Isolation Pilot Plant (WIPP). The possibility for larger containers to meet WIPP Waste Acceptance Criteria needs to be investigated.
II. Sludge retrieval to containers, transport to storage	Sludge is retrieved by pumping as a thick slurry, or mechanically removed as a semisolid, and placed in approximately 50 large containers. The material is assayed during removal while being placed in containers. The containers are transported to storage in the T-Plant canyon along with the K-Basin sludge or another storage location on site. At some later time, solidification will be conducted with a system to be provided for treating the K-Basin sludge. Eventual disposal would be to WIPP.
III. Sludge retrieval, transport to tank farms for storage	Sludge is retrieved by pumping as a thin slurry to a processing system designed to reduce particle size to meet acceptance criteria for compatiblility with the tank farm vitrification equipment. The processed sludge is then assayed and conveyed via approximately 16 tanker truck loads to a double-shell storage tank. Ultimately, the sludge will be vitrified as glass logs with other tank farm waste.
IV. In situ vitrification (ISV)	The ISV process converts the sludge, the tank, and a limited amount of surrounding soil to a vitrified, monolithic mass. The sludge remains in the tank. First, the tank is filled with soil and the top is fractured. Large electrodes are placed alongside the tank, and an off-gas hood and treatment system are placed atop the tank. An electrical supply of approximately 4 megawatts is converted to proper time-programmed voltage and current with special equipment trailers. The tank and contents are converted to glass over a two-week period. The glass becomes cool enough for access in approximately one year. Eventual disposal needs to be determined; that is, it must be determined whether the vitrified mass can remain in place at PFP or must be removed for disposal at WIPP or elsewhere.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Conclusions reached by the project based on the information now available are described below. The recommendation for the regulatory path forward for the project is also discussed.

6.1 Conclusions

Based on evaluation of the characterization data on Tank 241-Z-361, the remedial technologies available, and the potential threat to human health and the environment, DOE has come to the following conclusions:

- The sludge constitutes a principal threat waste under CERCLA guidance.
- Criticality hazard from the tank sludge is minimal.
- Flammability hazard from the tank sludge is negligible.
- Plutonium mobility is limited.
- Structural stability of the tank is expected to be adequate for the lifetime of any expedited response selected, provided current load restrictions on the tank top are maintained; however, the long-term stability cannot be confirmed.
- No new management controls are needed at this time.
- Several technologies appear to be feasible for remediation of the Z-361 sludge.
- An expedited response is probably not justified strictly on the basis of an identified threat; however, there are a number of other reasons to pursue an expedited response for a principal threat waste.

Any removal action under CERCLA would be non-time critical and not emergency or time critical.

6.2 Comparison of Potential Regulatory Paths Forward

Potential regulatory paths forward for the Z-361 project have been explored and compared from the standpoint of the project itself and from a sitewide perspective. As discussed in section 4.0 and shown in Figure 4-1, a removal action, an interim remedial action, and deferral to the Remedial Investigation / Feasibility Study (RI/FS) for the 200-PW-1 Operable Unit were evaluated. Results of the comparison are given in Table 6-1.

Table 6-1
Comparison of Potential Regulatory Path Forward Options

Option	Advantages	Disadvantages	Comments
Non-Time Critical Removal Action	Less paperwork than remedial action; No statutory time requirements	No Record of Decision	Appropriate if no treatability studies required (retrieval, cementation)
Interim Remedial Action	Record of Decision required	Significant documentation and cost for project; 15-month clock from ROD to field	Appropriate if treatability study required (in situ vitrification)
Deferral to 200-PW-1 Operable Unit	No action in near term	Potentially unacceptable to public	May not be justifiable strictly from threat standpoint due to principal threat waste

The potential regulatory paths are discussed in more detail below.

6.2.1 Non-Time Critical Removal Action

The key consideration on performing remediation of Z-361 as a removal action hinges on whether treatability studies would be required. Results of preliminary investigation indicate that treatability studies would be necessary for in situ vitrification (ISV) but not for retrieval of the sludge (by sluicing or mechanical means), cementation, or other commonly used technologies. The relatively low level of hazard associated with the Z-361 sludge indicates that, if a removal action were performed, it would best be done as non-time critical. From DOE's point of view, the primary advantage of a non-time critical removal is that a Record of Decision and the other extensive paperwork associated with a remedial action would not be required.

6.2.2 Interim Remedial Action

As noted in section 6.2.1 above, if treatability studies were required to implement the response on Z-361, the action would need to be performed as an interim remedial action. The only technology identified that would require treatability studies is ISV, Under an interim remedial action, a Record of Decision would be required. Relative to the non-time critical removal, preparation of a ROD would result in significant extra cost to the project and to DOE.

6.2.3 Deferral to 200-PW-1 Operable Unit

Deferral of Z-361 remediation to the 200-PW-1 Operable Unit for later remediation may be justifiable strictly from the standpoint of imminent threat analysis: Flammability hazard is negligible, criticality hazard is extremely low, tank integrity is adequate, and the plutonium in the sludge is not highly mobile. Deferral would offer the advantage of freeing up funding in the near term for remediation work on sites that pose a higher threat of release. However, deferral may not be acceptable to the public and the principal threat waste in the tank will ultimately require remediation.

6.3 Recommended Regulatory Path Forward

Based on review of the regulatory paths, DOE recommends that Tank 241-Z-361 be remediated under a non-time critical removal action. It is not known at this time that treatability studies would be required, so this regulatory path is preferred over the more complex and costly interim remedial action. This path has a number of additional advantages. The non-time critical removal would allow for the best integration with overall PFP transition activities on a risk-prioritized basis: Z-361 field activities would likely be scheduled after the most urgent Pu stabilization work has been completed, making for the most efficient use of personnel and allowing for smoother funding profiles. Conducting Z-361 remediation as stabilization is ramping down would also facilitate utilization of PFP expertise in, and infrastructure for, handling Pu-bearing materials while the expertise and infrastructure are still available. All things considered, it appears that a non-time critical removal action would be the most efficient expenditure of taxpayer dollars.

7.0 REFERENCES

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Toxic Substances Control Act of 1976, 15 USC 2601, et seq.

APPENDIX A

241-Z-361

DATA SUMMARY TABLE

Consisting of 23 pages including coversheet

Appendix A
Tank 241-Z-361 Rev 0 Data Summary Table*

Analyte	Method	Composite Number	Composite Result	Detection Limit	Qualifier DQA	Qualifier Validation
% Water	Gravimetric	263-1	71 %	0.01		
		263-2	69.1 %	0.01		
		263-3	62.7 %	0.01		
		263-4	52.2 %	0.01	J	
		263-5	70.3 %	0.01		
		263-6	70.8 %	0.01		
		263-7	69.5 %	0.01		
		263-8	65.4 %	0.01		
		264-1	84.4 %	0.01		
		264-2	76.7 %	0.01		
		264-3	65 %	0.01		
		264-4	67.1 %	0.01		
		264-5	66.3 %	0.01		
Aluminium	ICP (Fusion Digest)	263-1	10100 ug/g	1010		
		263-2	26400 ug/g	978		
		263-3	46500 ug/g	1000		
		263-4	38200 ug/g	1010		
		263-5	51200 ug/g	1000		
		263-6	27100 ug/g	1010		
		263-7	19900 ug/g	1000		
		263-8	2690 ug/g	978		
		264-1	1390 ug/g	994		
		264-2	10300 ug/g	965		
		264-3	39200 ug/g	956		
		264-4	30800 ug/g	996		
		264-5	12200 ug/g	973		
Americium-241	Alpha Energy Analysis (ion-exchange separation)	263-1	14.1 uCi/g	1.47		
		263-2	13.9 uCi/g	1.35		
		263-3	8.84 uCi/g	1.26		
		263-4	3.86 uCi/g	0.648		
		263-5	4.67 uCi/g	0.495		
		263-6	4.26 uCi/g	0.483		
		263-7	1.35 uCi/g	0.186		
		263-8	0.306 uCi/g	0.0658		
		264-1	7.46 uCi/g	0.779		
		264-2	13.4 uCi/g	1.49		
		264-3	5.66 uCi/g	1.16		
		264-4	4.81 uCi/g	0.975		
		264-5	1.04 uCi/g	0.226		

*All results reported on wet weight (as received) basis.

Appendix A
Tank 241-Z-361 Rev 0 Data Summary Table*

Analyte	Method	Number	Composite Result		Limit	DQA	Validation
Ammonia/Ammonium	Ion-selective electrode	263-1	<	493 ug/g	493		
		263-2	<	482 ug/g	482		
		263-3	<	498 ug/g	498		
		263-4	<	486 ug/g	486		
		263-5	<	496 ug/g	496		
		263-6		656 ug/g	523		
		263-7	<	512 ug/g	512		
		263-8	<	513 ug/g	513		
		264-1	<	498 ug/g	498		
		264-2	<	491 ug/g	491		
		264-3	<	494 ug/g	494		
		264-4	<	490 ug/g	490		
		264-5		649 ug/g	510		
Arsenic	ICP (Acid Digest)	263-1	<	20.1 ug/g	20		
		263-2	<	19.5 ug/g	19.5		
		263-3	<	9.8 ug/g	9.8		
		263-4	<	10.1 ug/g	10.1		
		263-5	<	10.1 ug/g	10.1		
		263-6	<	19.9 ug/g	19.9		
		263-7	<	19.8 ug/g	19.8		
		263-8	<	40.2 ug/g	40.2		
		264-1		23.4 ug/g	20.3		
		264-2	<	20.4 ug/g	20.4		
		264-3	<	19.7 ug/g	19.7		
		264-4	<	20.7 ug/g	20.7		
		264-5	<	21.1 ug/g	21.1		
Barium	ICP (Acid Digest)	263-1		111 ug/g	10		
		263-2		105 ug/g	9.74		
		263-3		104 ug/g	4.9		
		263-4		111 ug/g	5.06		
		263-5		152 ug/g	5.06		
		263-6		116 ug/g	9.96		
		263-7		131 ug/g	9.92		
		263-8		197 ug/g	20		
		264-1		87.1 ug/g	10.1		
		264-2		93 ug/g	10.2		
		264-3		192 ug/g	9.86		
		264-4		114 ug/g	10.3		
		264-5		144 ug/g	10.5		

*All results reported on wet weight (as received) basis.

Appendix A
Tank 241-Z-361 Rev 0 Data Summary Table*

Analyte	Method	Number	Composite Result		Limit	DQA	Validation
Beryllium	ICP (Acid Digest)	263-1	<	1 ug/g	1		
		263-2	<	0.975 ug/g	0.974		
		263-3	<	0.49 ug/g	0.49		
		263-4	<	0.506 ug/g	0.506		
		263-5	<	0.506 ug/g	0.506		
		263-6	<	0.996 ug/g	0.996		
		263-7	<	0.992 ug/g	0.992		
		263-8	<	2.01 ug/g	2		
		264-1	<	1.01 ug/g	1.01		
		264-2	<	1.02 ug/g	1.02		
		264-3	<	0.986 ug/g	0.986		
		264-4	<	1.03 ug/g	1.03		
		264-5	<	1.05 ug/g	1.05		
Bromide	Ion chromatography of water extract	263-1		1040 ug/g	147.9		
		263-2		2710 ug/g	144.7		
		263-3		638 ug/g	149.5		
		263-4		1050 ug/g	145.7		
		263-5		2630 ug/g	148.8		
		263-6		1660 ug/g	152.8		
		263-7		1930 ug/g	149.5		
		263-8		1770 ug/g	149.9		
		264-1		280 ug/g	149.5		
		264-2		1150 ug/g	147.2		
		264-3		5370 ug/g	148.2		
		264-4		3110 ug/g	147.1		
		264-5		1370 ug/g	153.1		
Cadmium	ICP (Acid Digest)	263-1		54.7 ug/g	1		
		263-2		56.7 ug/g	0.974		
		263-3		45 ug/g	0.49		
		263-4		32.8 ug/g	0.506		
		263-5		74.7 ug/g	0.506		
		263-6		1.48 ug/g	0.996		
		263-7		2.15 ug/g	0.992		
		263-8		21.4 ug/g	2		
		264-1		17.8 ug/g	1.01		
		264-2		58.7 ug/g	1.02		
		264-3		112 ug/g	0.986		
		264-4		16 ug/g	1.03		
		264-5		17.1 ug/g	1.05		

*All results reported on wet weight (as received) basis.

Appendix A
Tank 241-Z-361 Rev 0 Data Summary Table*

Analyte	Method	Number	Composite Result	Limit	DQA	Validation
Calcium	ICP (Fusion Digest)	263-1	39300 ug/g	2020		
		263-2	32600 ug/g	1960		
		263-3	41200 ug/g	2010		
		263-4	49500 ug/g	2020		
		263-5	70100 ug/g	2010		
		263-6	60600 ug/g	2010		
		263-7	73100 ug/g	2010		
		263-8	103000 ug/g	1960		
		264-1	28500 ug/g	1990		
		264-2	32800 ug/g	1930		
		264-3	70100 ug/g	1910		
		264-4	62100 ug/g	1990		
		264-5	91600 ug/g	1950		
Chloride	Ion chromatography of water extract	263-1	647 ug/g	20.11		
		263-2	510 ug/g	19.68		
		263-3	532 ug/g	20.33		
		263-4	606 ug/g	19.81		
		263-5	482 ug/g	20.24		
		263-6	907 ug/g	20.78		
		263-7	858 ug/g	20.33		
		263-8	835 ug/g	20.38		
		264-1	718 ug/g	20.33		
		264-2	572 ug/g	20.02		
		264-3	565 ug/g	20.15		
		264-4	612 ug/g	20		
		264-5	562 ug/g	20.82		
Chromium	ICP (Acid Digest)	263-1	4030 ug/g	2		
		263-2	936 ug/g	1.95		
		263-3	691 ug/g	0.98		
		263-4	710 ug/g	1.01		
		263-5	926 ug/g	1.01		
		263-6	1340 ug/g	1.99		
		263-7	2150 ug/g	1.98		
		263-8	10000 ug/g	4.02		
		264-1	5910 ug/g	20.3		
		264-2	3090 ug/g	2.04		
		264-3	1110 ug/g	1.97		
		264-4	1220 ug/g	2.07		
		264-5	4260 ug/g	2.11		

*All results reported on wet weight (as received) basis.

Appendix A
Tank 241-Z-361 Rev 0 Data Summary Table*

Analyte	Method	Number	Composite Result		Limit	DQA	Validation
Chromium	ICP (Fusion Digest)	263-1		5050 ug/g	202		
		263-2		1260 ug/g	196		
		263-3		881 ug/g	201		
		263-4		815 ug/g	202		
		263-5		1420 ug/g	201		
		263-6		1380 ug/g	201		
		263-7		2320 ug/g	201		
		263-8		8560 ug/g	196		
		264-1		6220 ug/g	199		
		264-2		3210 ug/g	193		
		264-3		1270 ug/g	191		
		264-4		1400 ug/g	199		
		264-5		5040 ug/g	195		
Cyanide	EDTA Distillation/ Spectrophotometry	263-1	<	0.738 ug/g	0.738		
		263-2	<	0.9 ug/g	0.9		
		263-3	<	0.787 ug/g	0.787		
		263-4	<	0.883 ug/g	0.883		
		263-5	<	0.799 ug/g	0.799		
		263-6		1.41 ug/g	0.861		
		263-7		1.01 ug/g	0.838		
		263-8		1.34 ug/g	0.77		
		264-1	<	0.695 ug/g	0.695		
		264-2	<	0.875 ug/g	0.875		
		264-3	<	0.766 ug/g	0.766		
		264-4	<	0.796 ug/g	0.796		
		264-5	<	0.65 ug/g	0.65		
Dibutyl phosphate - derivitized	GC/MS	263-1		3 ug/g	47	J	
		263-2	<	49 ug/g	49	J	
		263-3	<	43 ug/g	43	J	
		263-4		0.4 ug/g	45	J	
		263-5	<	39 ug/g	39	J	
		263-6		0.5 ug/g	45	J	
		263-7		2 ug/g	45		
		263-8		0.6 ug/g	44	J	
		264-1		0.5 ug/g	39	J	
		264-2	<	41 ug/g	41		
		264-3		0.3 ug/g	46		
		264-4	<	44 ug/g	44		
		264-5	<	49 ug/g	49		

*All results reported on wet weight (as received) basis.

Appendix A
Tank 241-Z-361 Rev 0 Data Summary Table*

Analyte	Method	Number	Composite Result		Limit	DQA	Validation
Dibutylbutyl Phosphonate	GC/MS	263-1	<	17 ug/g	17		
		263-2	<	18 ug/g	18		
		263-3	<	16 ug/g	16		
		263-4	<	16 ug/g	16		
		263-5	<	14 ug/g	14		
		263-6	<	17 ug/g	17		
		263-7	<	17 ug/g	17		
		263-8	<	16 ug/g	16		
		264-1	<	14 ug/g	14		
		264-2	<	15 ug/g	15		
		264-3	<	17 ug/g	17		
		264-4	<	16 ug/g	16		
		264-5	<	18 ug/g	18		
Fluoride	Ion chromatography of water extract	263-1		4430 ug/g	14.2		
		263-2		10800 ug/g	13.89		
		263-3		7310 ug/g	14.35		
		263-4		2370 ug/g	13.99		
		263-5		2980 ug/g	14.29		
		263-6		3840 ug/g	14.67		
		263-7		5770 ug/g	14.35		
		263-8		5760 ug/g	14.39		
		264-1		1070 ug/g	14.35		
		264-2		3820 ug/g	14.13		
		264-3		8300 ug/g	14.23		
		264-4		2850 ug/g	14.12		
		264-5		3820 ug/g	14.69		
Gross Alpha of Digested Solid	Alpha proportional count of fusion digest	263-1		37.4 uCi/g	0.00828		
		263-2		36.2 uCi/g	0.00803		
		263-3		42.6 uCi/g	0.00825		
		263-4		18.9 uCi/g	0.00827		
		263-5		25.4 uCi/g	0.0195		
		263-6		25.2 uCi/g	0.0195		
		263-7		7.3 uCi/g	0.0195		
		263-8		3.87 uCi/g	0.019		
		264-1		16.9 uCi/g	0.0151		
		264-2		37.9 uCi/g	0.0147		
		264-3		30.2 uCi/g	0.0145		
		264-4		27.8 uCi/g	0.0151		
		264-5		6.33 uCi/g	0.0148		

*All results reported on wet weight (as received) basis.

Appendix A
Tank 241-Z-361 Rev 0 Data Summary Table*

Analyte	Method	Number		Composite Result	Limit	DQA	Validation
Gross Beta of Solid Sample	Beta proportional count of fusion digest	263-1		2.35 uCi/g	0.0228		
		263-2		2.13 uCi/g	0.0221		
		263-3		2.45 uCi/g	0.054		
		263-4		0.837 uCi/g	0.0228		
		263-5		1.38 uCi/g	0.0676		
		263-6		1.35 uCi/g	0.0677		
		263-7		0.454 uCi/g	0.0675		
		263-8		0.146 uCi/g	0.0658		
		264-1		2.21 uCi/g	0.0502		
		264-2		3.96 uCi/g	0.0487		
		264-3		2.42 uCi/g	0.0483		
		264-4		2.18 uCi/g	0.0503		
		264-5		0.552 uCi/g	0.0491		
Hydroxide	Potentiometric Titration	263-1	<	8220 ug/g	8220		
		263-2	<	8040 ug/g	8040		
		263-3	<	8300 ug/g	8300		
		263-4	<	8090 ug/g	8090		
		263-5	<	8270 ug/g	8270		
		263-6	<	8480 ug/g	8480		
		263-7	<	8010 ug/g	8010		
		263-8	<	8340 ug/g	8340		
		264-1	<	8310 ug/g	8300		
		264-2	<	8180 ug/g	8180		
		264-3	<	8230 ug/g	8230		
		264-4	<	8170 ug/g	8170		
		264-5	<	8510 ug/g	8510		
Iron	ICP (Fusion Digest)	263-1		44800 ug/g	1010		
		263-2		28200 ug/g	978		
		263-3		6970 ug/g	1000		
		263-4		3730 ug/g	1010		
		263-5		3840 ug/g	1000		
		263-6		3850 ug/g	1010		
		263-7		6830 ug/g	1000		
		263-8		20600 ug/g	978		
		264-1		33000 ug/g	994		
		264-2		31800 ug/g	965		
		264-3		4500 ug/g	956		
		264-4		4680 ug/g	996		
		264-5		12700 ug/g	973		

*All results reported on wet weight (as received) basis.

Appendix A
Tank 241-Z-361 Rev 0 Data Summary Table*

Analyte	Method	Number	Composite Result	Limit	DQA	Validation
Lead	ICP (Acid Digest)	263-1	367 ug/g	20		
		263-2	120 ug/g	19.5		
		263-3	75.8 ug/g	9.8		
		263-4	32 ug/g	10.1		
		263-5	34.5 ug/g	10.1		
		263-6	33.8 ug/g	19.9		
		263-7	91.9 ug/g	19.8		
		263-8	446 ug/g	40.2		
		264-1	136 ug/g	20.3		
		264-2	263 ug/g	20.4		
		264-3	53.6 ug/g	19.7		
		264-4	49.4 ug/g	20.7		
		264-5	173 ug/g	21.1		
Lithium	ICP (Acid Digest)	263-1	75.1 ug/g	2		
		263-2	222 ug/g	1.95		
		263-3	31.3 ug/g	0.98		
		263-4	95.9 ug/g	1.01		
		263-5	230 ug/g	1.01		
		263-6	72.3 ug/g	1.99		
		263-7	275 ug/g	1.98		
		263-8	101 ug/g	4.02		
		264-1	13.8 ug/g	2.03		
		264-2	374 ug/g	2.04		
		264-3	94.2 ug/g	1.97		
		264-4	237 ug/g	2.07		
		264-5	89.9 ug/g	2.11		
Magnesium	ICP (Fusion Digest)	263-1	7290 ug/g	2020		
		263-2	5030 ug/g	1960		
		263-3	4910 ug/g	2010		
		263-4	5120 ug/g	2020		
		263-5	6940 ug/g	2010		
		263-6	10800 ug/g	2010		
		263-7	8810 ug/g	2010		
		263-8	6950 ug/g	1960		
		264-1	4890 ug/g	1990		
		264-2	6320 ug/g	1930		
		264-3	6350 ug/g	1910		
		264-4	10700 ug/g	1990		
		264-5	8530 ug/g	1950		

*All results reported on wet weight (as received) basis.

Appendix A
Tank 241-Z-361 Rev 0 Data Summary Table*

Analyte	Method	Number		Composite Result	Limit	DQA	Validation
Manganese	ICP (Fusion Digest)	263-1		565 ug/g	202		
		263-2		301 ug/g	196		
		263-3		286 ug/g	201		
		263-4	<	202 ug/g	202		
		263-5	<	201 ug/g	201		
		263-6	<	201 ug/g	201		
		263-7		422 ug/g	201		
		263-8	<	196 ug/g	196		
		264-1		771 ug/g	199		
		264-2		635 ug/g	193		
		264-3	<	191 ug/g	191		
		264-4	<	199 ug/g	199		
		264-5		439 ug/g	195		
Mercury	Cold Vapor Atomic Absorption	263-1		177 ug/g	3.94		
		263-2		63.48 ug/g	1.03		
		263-3		20.48 ug/g	1.24		
		263-4		35.97 ug/g	1.21		
		263-5		21.29 ug/g	1.3		
		263-6		18.65 ug/g	1.08		
		263-7		23.37 ug/g	0.94		
		263-8		20.68 ug/g	1.38		
		264-1		65.1 ug/g	0.73		
		264-2		82.96 ug/g	0.76		
		264-3		26.82 ug/g	0.6		
		264-4		37.57 ug/g	0.69		
		264-5		67.73 ug/g	0.69		
Neptunium-237	TTA Extraction/Alpha proportional counting	263-1		0.00302 uCi/g	0.00368		U
		263-2		0.00293 uCi/g	0.00357		U
		263-3	<	0.00196 uCi/g	0.00367		U
		263-4	<	0.00229 uCi/g	0.00368		U
		263-5	<	0.00225 uCi/g	0.00488		U
		263-6	<	0.00225 uCi/g	0.00488		U
		263-7	<	0.00224 uCi/g	0.00487		U
		263-8	<	0.00218 uCi/g	0.00475		U
		264-1	<	0.00614 uCi/g	0.00697		U
		264-2		0.00523 uCi/g	0.00676		U
		264-3	<	0.00404 uCi/g	0.00671		U
		264-4		0.00426 uCi/g	0.00699		U
		264-5	<	0.00601 uCi/g	0.00683		U

*All results reported on wet weight (as received) basis.

Appendix A
Tank 241-Z-361 Rev 0 Data Summary Table*

Analyte	Method	Number		Composite Result	Limit	DQA	Validation
Nickel	ICP (Acid Digest)	263-1		1530 ug/g	4.02		
		263-2		415 ug/g	3.9		
		263-3		86.7 ug/g	1.96		
		263-4		56.7 ug/g	2.03		
		263-5		68.3 ug/g	2.03		
		263-6		210 ug/g	3.98		
		263-7		325 ug/g	3.96		
		263-8		1580 ug/g	8.04		
		264-1		3360 ug/g	40.5		
		264-2		1310 ug/g	4.07		
		264-3		91.1 ug/g	3.94		
		264-4		196 ug/g	4.14		
		264-5		680 ug/g	4.21		
Nitrate	Ion chromatography of water extract	263-1		1000 ug/g	164.5		
		263-2		435 ug/g	160.9		
		263-3		314 ug/g	166.3		
		263-4		209 ug/g	162		
		263-5	<	166 ug/g	165.5		
		263-6		346 ug/g	170		
		263-7	<	166 ug/g	166.3		
		263-8	<	167 ug/g	166.7		
		264-1		1230 ug/g	166.3		
		264-2	<	164 ug/g	163.7		
		264-3		603 ug/g	164.8		
		264-4	<	164 ug/g	163.6		
		264-5	<	170 ug/g	170.2		
Nitrite	Ion chromatography of water extract	263-1		519 ug/g	127.8		
		263-2		737 ug/g	125		
		263-3		909 ug/g	129.2		
		263-4		1020 ug/g	125.9		
		263-5		863 ug/g	128.6		
		263-6		1370 ug/g	132.1		
		263-7		1540 ug/g	129.2		
		263-8		1530 ug/g	129.5		
		264-1		362 ug/g	129.2		
		264-2		867 ug/g	127.2		
		264-3		527 ug/g	128		
		264-4		986 ug/g	127.1		
		264-5		971 ug/g	132.3		

*All results reported on wet weight (as received) basis.

Appendix A
Tank 241-Z-361 Rev 0 Data Summary Table*

Analyte	Method	Number		Composite Result	Limit	DQA	Validation
pH on Solid Samples	pH electrode in 1:1 sludge/water suspension	263-1		8.16 pH	0.01		
		263-2		8.3 pH	0.01		
		263-3		8.49 pH	0.01		
		263-4		8.79 pH	0.01		
		263-5		8.67 pH	0.01		
		263-6		8.79 pH	0.01		
		263-7		8.68 pH	0.01		
		263-8		9.18 pH	0.01		
		264-1		8.6 pH	0.01		
		264-2		8.06 pH	0.01		
		264-3		8.55 pH	0.01		
		264-4		8.48 pH	0.01		
		264-5		8.78 pH	0.01		
Phosphate	Ion chromatography of water extract	263-1	<	142 ug/g	142		
		263-2	<	139 ug/g	138.9		
		263-3	<	144 ug/g	143.5		
		263-4	<	140 ug/g	139.9		
		263-5	<	143 ug/g	142.9		
		263-6	<	147 ug/g	146.7		
		263-7	<	144 ug/g	143.5		
		263-8	<	144 ug/g	143.9		
		264-1	<	144 ug/g	143.5		
		264-2	<	141 ug/g	141.3		
		264-3	<	142 ug/g	142.3		
		264-4	<	141 ug/g	141.2		
		264-5	<	147 ug/g	146.9		
Phosphorus	ICP (Acid Digest)	263-1		578 ug/g	40.2		
		263-2		141 ug/g	39		
		263-3		133 ug/g	19.6		
		263-4		173 ug/g	20.3		
		263-5		156 ug/g	20.3		
		263-6		139 ug/g	39.8		
		263-7		169 ug/g	39.6		
		263-8		831 ug/g	80.4		
		264-1		656 ug/g	40.5		
		264-2		405 ug/g	40.7		
		264-3		201 ug/g	39.4		
		264-4		135 ug/g	41.4		
		264-5		306 ug/g	42.1		

*All results reported on wet weight (as received) basis.

Appendix A
Tank 241-Z-361 Rev 0 Data Summary Table*

Analyte	Method	Number		Composite Result	Limit	DQA	Validation
Phthalate	Ion chromatography of water extract	263-1	<	4420 ug/g	4420		
		263-2	<	4320 ug/g	4320		
		263-3	<	4460 ug/g	4460		
		263-4	<	4350 ug/g	4350		
		263-5	<	4440 ug/g	4440		
		263-6	<	1140 ug/g	1140		
		263-7	<	1120 ug/g	1120		
		263-8	<	1120 ug/g	1120		
		264-1	<	1120 ug/g	1120		
		264-2	<	1100 ug/g	1100		
		264-3	<	1110 ug/g	1110		
		264-4	<	1100 ug/g	1100		
		264-5	<	1140 ug/g	1140		
Plutonium-238	Alpha Energy Analysis (ion-exchange separation of fusion digest)	263-1		2.3 uCi/g	1.75		
		263-2	<	1.7 uCi/g	1.7		U
		263-3	<	2.25 uCi/g	2.25		U
		263-4	<	0.968 uCi/g	0.968		U
		263-5	<	1.14 uCi/g	1.14		U
		263-6	<	1.12 uCi/g	1.12		U
		263-7	<	0.377 uCi/g	0.377		U
		263-8	<	0.201 uCi/g	0.201		U
		264-1	<	0.67 uCi/g	0.67		U
		264-2	<	1.68 uCi/g	1.68		U
		264-3	<	1.54 uCi/g	1.54		U
		264-4	<	1.52 uCi/g	1.52		U
		264-5	<	0.331 uCi/g	0.331		U
Plutonium-239	ICP/MS (Fusion Digest)	263-1		331 ug/g	24.68		
		263-2		388 ug/g	23.93		
		263-3		578 ug/g	24.6		
		263-4		253 ug/g	24.67		
		263-5		329 ug/g	24.61		J
		263-6		328 ug/g	24.62		J
		263-7		114 ug/g	24.56		J
		263-8		69.07 ug/g	23.93		J
		264-1		147 ug/g	24.32		J
		264-2		414 ug/g	23.6		J
		264-3		428 ug/g	23.42		J
		264-4		402 ug/g	24.39		J
		264-5		104 ug/g	23.82		J

*All results reported on wet weight (as received) basis.

Appendix A
Tank 241-Z-361 Rev 0 Data Summary Table*

Analyte	Method	Number		Composite Result	Limit	DQA	Validation
Plutonium-239	ICP/MS (ion-exchange separation of fusion digest)	263-1		362 ug/g	0.33		
		263-2		357 ug/g	0.319		
		263-3		551 ug/g	0.328		
		263-4		218 ug/g	0.329		
		263-5		300 ug/g	0.329		
		263-6		331 ug/g	0.329		
		263-7		102 ug/g	0.328		
		263-8		70.84 ug/g	0.319		
		264-1		123 ug/g	0.325		
		264-2		372 ug/g	0.315		
		264-3		320 ug/g	0.313		
		264-4		384 ug/g	0.326		
		264-5		94.42 ug/g	0.318		
Plutonium-239/240	Alpha Energy Analysis (ion-exchange separation of fusion digest)	263-1		26.8 uCi/g	1.75		
		263-2		28.6 uCi/g	1.7		
		263-3		42.4 uCi/g	2.25		
		263-4		17.7 uCi/g	0.968		
		263-5		23.7 uCi/g	1.14		
		263-6		23.8 uCi/g	1.12		
		263-7		7.26 uCi/g	0.377		
		263-8		4.21 uCi/g	0.201		
		264-1		9.28 uCi/g	0.67		
		264-2		29.1 uCi/g	1.68		
		264-3		26.5 uCi/g	1.54		
		264-4		26.1 uCi/g	1.52		
		264-5		6 uCi/g	0.331		
Plutonium-240	ICP/MS (Fusion Digest)	263-1		25.5 ug/g	24.68		
		263-2	<	23.93 ug/g	23.93		U
		263-3		37.23 ug/g	24.6		
		263-4	<	24.67 ug/g	24.67		U
		263-5	<	24.6 ug/g	24.61		U
		263-6	<	24.62 ug/g	24.62		U
		263-7	<	24.56 ug/g	24.56		U
		263-8	<	23.93 ug/g	23.93		U
		264-1	<	24.32 ug/g	24.32		U
		264-2		28.48 ug/g	23.6		
		264-3		30.13 ug/g	23.42		
		264-4		27.63 ug/g	24.39		
		264-5	<	23.82 ug/g	23.82		U

*All results reported on wet weight (as received) basis.

Appendix A
Tank 241-Z-361 Rev 0 Data Summary Table*

Analyte	Method	Number		Composite Result	Limit	DQA	Validation
Plutonium-240	ICP/MS (ion-exchange separation of fusion digest)	263-1		45.41 ug/g	0.33		
		263-2		40.95 ug/g	0.319		
		263-3		60.97 ug/g	0.328		
		263-4		25.28 ug/g	0.329		
		263-5		30.15 ug/g	0.329		
		263-6		31.13 ug/g	0.329		
		263-7		10.19 ug/g	0.328		
		263-8		3.543 ug/g	0.319		
		264-1		15.21 ug/g	0.325		
		264-2		44.23 ug/g	0.315		
		264-3		33.51 ug/g	0.313		
		264-4		36.28 ug/g	0.326		
		264-5		8.459 ug/g	0.318		
Plutonium-241	ICP/MS (ion-exchange separation of fusion digest)	263-1		0.87 ug/g	0.33		
		263-2		0.69 ug/g	0.319		
		263-3		0.803 ug/g	0.328		
*NOTE: see discussion of calculated values in laboratory narrative.		263-4		0.366 ug/g	0.329		
		263-5		0.381 ug/g	0.329		
		263-6	<	0.329 ug/g	0.329		U
		263-7	<	0.328 ug/g	0.328		U
		263-8	<	0.319 ug/g	0.319		U
		264-1	<	0.325 ug/g	0.325		U
		264-2		0.808 ug/g	0.315		
		264-3		0.398 ug/g	0.313		
		264-4		0.408 ug/g	0.326		
		264-5	<	0.318 ug/g	0.318		U
Plutonium/ Americium-241	ICP/MS (Fusion Digest)	263-1	<	24.68 ug/g	24.68		U
		263-2	<	23.93 ug/g	23.93		U
		263-3	<	24.6 ug/g	24.6		U
		263-4	<	24.67 ug/g	24.67		U
		263-5	<	24.6 ug/g	24.61		U
		263-6	<	24.62 ug/g	24.62		U
		263-7	<	24.56 ug/g	24.56		U
		263-8	<	23.93 ug/g	23.93		U
		264-1	<	24.32 ug/g	24.32		U
		264-2	<	23.6 ug/g	23.6		U
		264-3	<	23.42 ug/g	23.42		U
		264-4	<	24.39 ug/g	24.39		U
		264-5	<	23.82 ug/g	23.82		U

*All results reported on wet weight (as received) basis.

Appendix A
Tank 241-Z-361 Rev 0 Data Summary Table*

Analyte	Method	Number		Composite Result	Limit	DQA	Validation
Potassium	ICP (Acid Digest)	263-1	<	100 ug/g	100		
		263-2	<	97.5 ug/g	97.4		
		263-3	<	49 ug/g	49		
		263-4	<	50.6 ug/g	50.6		
		263-5	<	50.6 ug/g	50.6		
		263-6	<	99.6 ug/g	99.6		
		263-7	<	99.2 ug/g	99.2		
		263-8		270 ug/g	200		
		264-1	<	101 ug/g	101		
		264-2	<	102 ug/g	102		
		264-3	<	98.6 ug/g	98.6		
		264-4	<	103 ug/g	103		
		264-5	<	105 ug/g	105		
Silicon	ICP (Fusion Digest)	263-1		2100 ug/g	1010		
		263-2		1640 ug/g	978		
		263-3		1540 ug/g	1000		
		263-4		1180 ug/g	1010		
		263-5		2170 ug/g	1000		
		263-6		1560 ug/g	1010		
		263-7		2470 ug/g	1000		
		263-8	<	978 ug/g	978		
		264-1		2050 ug/g	994		
		264-2		1780 ug/g	965		
		264-3		1480 ug/g	956		
		264-4		1590 ug/g	996		
		264-5		1950 ug/g	973		
Silver	ICP (Acid Digest)	263-1		34.6 ug/g	2		
		263-2		15.6 ug/g	1.95		
		263-3		24.4 ug/g	0.98		
		263-4		59.3 ug/g	1.01		
		263-5		40.6 ug/g	1.01		
		263-6		17.2 ug/g	1.99		
		263-7		29.1 ug/g	1.98		
		263-8		182 ug/g	4.02		
		264-1		17.8 ug/g	2.03		
		264-2		22.4 ug/g	2.04		
		264-3		60.3 ug/g	1.97		
		264-4		17.2 ug/g	2.07		
		264-5		128 ug/g	2.11		

*All results reported on wet weight (as received) basis.

Appendix A
Tank 241-Z-361 Rev 0 Data Summary Table*

Analyte	Method	Number	Composite Result	Limit	DQA	Validation
Sodium	ICP (Fusion Digest)	263-1	11000 ug/g	2020		
		263-2	39200 ug/g	1960		
		263-3	17200 ug/g	2010		
		263-4	7830 ug/g	2020		
		263-5	9610 ug/g	2010		
		263-6	8490 ug/g	2010		
		263-7	5860 ug/g	2010		
		263-8	9240 ug/g	1960		
		264-1	3290 ug/g	1990		
		264-2	23800 ug/g	1930		
		264-3	10700 ug/g	1910		
		264-4	7040 ug/g	1990		
		264-5	6620 ug/g	1950		
Specific Conductance of Liquid	Electrode	263-6	130 uS/cm	1		
		263-7	98.8 uS/cm	1		
		263-8	139 uS/cm	1		
Specific Gravity-Solid/Sludges	Gravimetric	263-1	1.63	0.0499		
		263-2	1.39	0.0499		
		263-3	1.37	0.0499		
		263-4	1.19	0.0499		
		263-5	1.38	0.0499		
		263-6	1.08	0.0499		
		263-7	1.44	0.0499		
		263-8	1.36	0.0499		
		264-1	1.02	0.0499		
		264-2	1.38	0.0499		
		264-3	1.38	0.0499		
		264-4	1.45	0.0499		
		264-5	1.65	0.0499		
Strontium-89/90	Extraction/Beta proportional counting	263-1	0.00829 uCi/g	0.000698		J
		263-2	0.00562 uCi/g	0.000672		J
		263-3	0.00249 uCi/g	0.000687		J
		263-4	0.0184 uCi/g	0.000683		J
		263-5	0.0145 uCi/g	0.000746		
		263-6	0.000649 uCi/g	0.000779		U
		263-7	0.00319 uCi/g	0.000741		
		263-8	0.00236 uCi/g	0.000709		
		264-1	0.0306 uCi/g	0.000795		
		264-2	0.044 uCi/g	0.000753		
		264-3	0.0187 uCi/g	0.000746		
		264-4	0.00556 uCi/g	0.000771		
		264-5	0.00709 uCi/g	0.000758		

*All results reported on wet weight (as received) basis.

Appendix A
Tank 241-Z-361 Rev 0 Data Summary Table*

Analyte	Method	Number	Composite Result	Limit	DQA	Validation
Sulfate	Ion chromatography of water extract	263-1	1780 ug/g	163.3		
		263-2	1320 ug/g	159.8		
		263-3	1310 ug/g	165.1		
		263-4	1240 ug/g	160.9		
		263-5	1100 ug/g	164.3		
		263-6	1480 ug/g	168.7		
		263-7	1980 ug/g	165.1		
		263-8	1950 ug/g	165.5		
		264-1	1560 ug/g	165.1		
		264-2	1130 ug/g	162.5		
		264-3	1400 ug/g	163.6		
		264-4	974 ug/g	162.4		
		264-5	1040 ug/g	169		
Sulfur	ICP (Acid Digest)	263-1	748 ug/g	20		
		263-2	441 ug/g	19.5		
		263-3	448 ug/g	9.8		
		263-4	499 ug/g	10.1		
		263-5	408 ug/g	10.1		
		263-6	433 ug/g	19.9		
		263-7	423 ug/g	19.8		
		263-8	1090 ug/g	40.2		
		264-1	683 ug/g	20.3		
		264-2	500 ug/g	20.4		
		264-3	471 ug/g	19.7		
		264-4	362 ug/g	20.7		
		264-5	529 ug/g	21.1		
Technetium-99	Solvent extraction/liquid scintillation	263-1	0.015 uCi/g	0.0014		
		263-2	0.0178 uCi/g	0.00135		
		263-3	0.0279 uCi/g	0.00138		
		263-4	0.0134 uCi/g	0.00138		
		263-5	0.017 uCi/g	0.00152		
		263-6	0.00125 uCi/g	0.000718		
		263-7	0.0119 uCi/g	0.00153		
		263-8	< 0.00149 uCi/g	0.00149		U
		264-1	0.00349 uCi/g	0.00139		
		264-2	0.0107 uCi/g	0.00122		
		264-3	0.0227 uCi/g	0.0014		
		264-4	0.0223 uCi/g	0.00143		
		264-5	0.00262 uCi/g	0.00143		

*All results reported on wet weight (as received) basis.

Appendix A
Tank 241-Z-361 Rev 0 Data Summary Table*

Analyte	Method	Number	Composite Result		Limit	DQA	Validation
Titanium	ICP (Fusion Digest)	263-1		276 ug/g	202		
		263-2	<	196 ug/g	196		
		263-3	<	201 ug/g	201		
		263-4	<	202 ug/g	202		
		263-5	<	201 ug/g	201		
		263-6	<	201 ug/g	201		
		263-7	<	201 ug/g	201		
		263-8	<	196 ug/g	196		
		264-1	<	199 ug/g	199		
		264-2		216 ug/g	193		
		264-3	<	191 ug/g	191		
		264-4	<	199 ug/g	199		
		264-5	<	195 ug/g	195		
Total Dissolv. Solids	Gravimetric	263-1	<	0.00028 g/mL	0.00028		
		263-2	<	0.00028 g/mL	0.00028		
		263-3	<	0.00028 g/mL	0.00028		
		263-4	<	0.00028 g/mL	0.00028		
		263-5	<	0.00028 g/mL	0.00028		
		263-6	<	0.00028 g/mL	0.00028		
		263-7	<	0.00028 g/mL	0.00028		
		263-8	<	0.00028 g/mL	0.00028		
		264-1	<	0.00028 g/mL	0.00028		
		264-2	<	0.00028 g/mL	0.00028		
		264-3	<	0.00028 g/mL	0.00028		
		264-4	<	0.00028 g/mL	0.00028		
		264-5	<	0.00028 g/mL	0.00028		
Tri-n-butylphosphate	GC/MS	263-1		0.6 ug/g	22		
		263-2		0.2 ug/g	20		
		263-3		0.6 ug/g	20		
		263-4		0.6 ug/g	21		
		263-5		0.6 ug/g	18		
		263-6		0.4 ug/g	21		
		263-7		0.4 ug/g	21		
		263-8		2 ug/g	21		
		264-1	<	18 ug/g	18		
		264-2		0.4 ug/g	19		
		264-3		2 ug/g	22		
		264-4		1 ug/g	21		
		264-5	<	23 ug/g	23		

*All results reported on wet weight (as received) basis.

Appendix A
Tank 241-Z-361 Rev 0 Data Summary Table*

Analyte	Method	Number	Composite Result		Limit	DQA	Validation
Uranium	ICP (Acid Digest)	263-1		115 ug/g	100		
		263-2	<	97.5 ug/g	97.4		
		263-3	<	49 ug/g	49		
		263-4	<	50.6 ug/g	50.6		
		263-5	<	50.6 ug/g	50.6		
		263-6	<	99.6 ug/g	99.6		
		263-7	<	99.2 ug/g	99.2		
		263-8	<	201 ug/g	200		
		264-1		138 ug/g	101		
		264-2		142 ug/g	102		
		264-3	<	98.6 ug/g	98.6		
		264-4	<	103 ug/g	103		
		264-5	<	105 ug/g	105		
Uranium-235	Fusion Digest/ICP/MS	263-1	<	19.74 ug/g	19.75		U
		263-2	<	19.15 ug/g	19.14		U
		263-3	<	19.68 ug/g	19.68		U
		263-4	<	19.73 ug/g	19.73		U
		263-5	<	19.68 ug/g	19.69		U
		263-6	<	19.7 ug/g	19.7		U
		263-7	<	19.65 ug/g	19.65		U
		263-8	<	19.14 ug/g	19.14		U
		264-1	<	19.46 ug/g	19.46		U
		264-2	<	18.88 ug/g	18.88		U
		264-3	<	18.74 ug/g	18.74		U
		264-4	<	19.51 ug/g	19.51		U
		264-5	<	19.05 ug/g	19.05		U
Uranium-238	Fusion Digest/ICP/MS	263-1		49.85 ug/g	19.75		
		263-2		21.38 ug/g	19.14		
		263-3		20.83 ug/g	19.68		
		263-4		32.56 ug/g	19.73		
		263-5		21.49 ug/g	19.69		
		263-6	<	19.7 ug/g	19.7		U
		263-7		26.36 ug/g	19.65		
		263-8		24.09 ug/g	19.14		
		264-1		58.37 ug/g	19.46		
		264-2		62.62 ug/g	18.88		
		264-3		34.04 ug/g	18.74		
		264-4		21.13 ug/g	19.51		
		264-5		32.23 ug/g	19.05		

*All results reported on wet weight (as received) basis.

Appendix A
Tank 241-Z-361 Rev 0 Data Summary Table*

Analyte	Method	Number		Composite Result	Limit	DQA	Validation
Zinc	ICP (Acid Digest)	263-1		393 ug/g	2		
		263-2		265 ug/g	1.95		
		263-3		124 ug/g	0.98		
		263-4		58.5 ug/g	1.01		
		263-5		88.9 ug/g	1.01		
		263-6		177 ug/g	1.99		
		263-7		303 ug/g	1.98		
		263-8		622 ug/g	4.02		
		264-1		263 ug/g	2.03		
		264-2		446 ug/g	2.04		
		264-3		109 ug/g	1.97		
		264-4		180 ug/g	2.07		
		264-5		367 ug/g	2.11		
Zirconium	ICP (Acid Digest)	263-1		75.7 ug/g	2		
		263-2		18 ug/g	1.95		
		263-3		3.89 ug/g	0.98		
		263-4		5.69 ug/g	1.01		
		263-5		4.36 ug/g	1.01		
		263-6	<	1.99 ug/g	1.99		
		263-7		3.84 ug/g	1.98		
		263-8		36.3 ug/g	4.02		
		264-1		193 ug/g	2.03		
		264-2		48 ug/g	2.04		
		264-3		8.7 ug/g	1.97		
		264-4		3.31 ug/g	2.07		
		264-5		14 ug/g	2.11		
Polychlorinated Biphenyls							
Aroclor-1232	GC	263-1	<	1000 ug/kg	1000		
		263-2	<	1000 ug/kg	1000		
		263-3	<	1000 ug/kg	1000		
		263-4	<	1000 ug/kg	1000		
		263-5	<	1000 ug/kg	1000		
		263-6	<	200 ug/kg	200		
		263-7	<	200 ug/kg	200		
		263-8	<	200 ug/kg	200		
		264-1	<	400 ug/kg	400		
		264-2	<	1000 ug/kg	1000		
		264-3	<	4000 ug/kg	4000		
		264-4	<	1000 ug/kg	1000		UJ
		264-5	<	200 ug/kg	200		

*All results reported on wet weight (as received) basis.

Appendix A
Tank 241-Z-361 Rev 0 Data Summary Table*

Analyte	Method	Number	Composite Result		Limit	DQA	Validation
Aroclor-1242	GC	263-1	<	1000 ug/kg	1000		UJ
		263-2	<	1000 ug/kg	1000		UJ
		263-3	<	1000 ug/kg	1000		UJ
		263-4	<	1000 ug/kg	1000		UJ
		263-5	<	1000 ug/kg	1000		UJ
		263-6	<	200 ug/kg	200		UJ
		263-7	<	200 ug/kg	200		UJ
		263-8	<	200 ug/kg	200		UJ
		264-1	<	400 ug/kg	400		UJ
		264-2	<	1000 ug/kg	1000		UJ
		264-3	<	4000 ug/kg	4000		UJ
		264-4	<	1000 ug/kg	1000		UJ
		264-5	<	200 ug/kg	200		UJ
Aroclor-1248	GC	263-1		5350 ug/kg	1000		J
		263-2		2525 ug/kg	1000		J
		263-3		5980 ug/kg	1000		J
		263-4		2280 ug/kg	1000		J
		263-5	<	1000 ug/kg	1000		UJ
		263-6	<	200 ug/kg	200		UJ
		263-7	<	200 ug/kg	200		UJ
		263-8	<	200 ug/kg	200		UJ
		264-1		3780 ug/kg	400		J
		264-2		11800 ug/kg	1000		J
		264-3		56000 ug/kg	4000		J
		264-4	<	1000 ug/kg	1000		UJ
		264-5		2610 ug/kg	200		J
Aroclor-1254	GC	263-1	<	1000 ug/kg	1000		
		263-2	<	1000 ug/kg	1000		
		263-3	<	1000 ug/kg	1000		
		263-4	<	1000 ug/kg	1000		
		263-5	<	1000 ug/kg	1000		
		263-6		322 ug/kg	200		
		263-7		1240 ug/kg	200		
		263-8		577 ug/kg	200		
		264-1	<	400 ug/kg	400		
		264-2	<	1000 ug/kg	1000		
		264-3	<	4000 ug/kg	4000		
		264-4	<	1000 ug/kg	1000		UJ
		264-5	<	200 ug/kg	200		

*All results reported on wet weight (as received) basis.

Appendix A
Tank 241-Z-361 Rev 0 Data Summary Table*

Analyte	Method	Number		Composite Result	Limit	DQA	Validation
Aroclor-1260	GC	263-1	<	1000 ug/kg	1000		
		263-2	<	1000 ug/kg	1000		
		263-3	<	1000 ug/kg	1000		
		263-4	<	1000 ug/kg	1000		
		263-5	<	1000 ug/kg	1000		
		263-6	<	200 ug/kg	200		
		263-7	<	200 ug/kg	200		
		263-8	<	200 ug/kg	200		
		264-1	<	400 ug/kg	400		
		264-2	<	1000 ug/kg	1000		
		264-3	<	4000 ug/kg	4000		
		264-4	<	1000 ug/kg	1000		UJ
		264-5	<	200 ug/kg	200		
Total Inorganic Carbon							
	Acid Digestion/Coulometry	263-1		3080 ug/g	5		
		263-2		2520 ug/g	5		
		263-3		8490 ug/g	5		J
		263-4		24500 ug/g	5		
		263-5		17600 ug/g	5		J
		263-6		24100 ug/g	5	J	
		263-7		5440 ug/g	5	J	
		263-8		13200 ug/g	5	J	
		264-1		1520 ug/g	5		
		264-2		1440 ug/g	5		
		264-3		17100 ug/g	5	J	
		264-4		19000 ug/g	5	J	
		264-5		16800 ug/g	5		
Total Organic Carbon							
		263-1		8410 ug/g	40		
	Persulfate Digestion/ Coulometry	263-2		1800 ug/g	40		
		263-3		730 ug/g	40	J	
		263-4		979 ug/g	40	J	
		263-5		1590 ug/g	40		
		263-6		1500 ug/g	40	J	
		263-7		946 ug/g	40	J	
		263-8		849 ug/g	40	J	
		264-1		1070 ug/g	40		
		264-2		3540 ug/g	40		
		264-3		2360 ug/g	40		
		264-4		662 ug/g	40		
		264-5		3200 ug/g	40		

*All results reported on wet weight (as received) basis.

APPENDIX B

DATA VALIDATION

REPORTS

Consisting of 147 pages including coversheet

APPENDIX C

DATA REPORT

Consisting of 2587 pages including coversheet